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BRIEFLY TOLD.

THE END OF THE WESTERN'S TWENTIETH MEETING.—Our special telegraphic advices, from "C.," last week, respecting the progress of the twentieth annual meeting of the Western Gas Association, in session in the Grand Hotel, Cincinnati, cleverly told the story of the meeting up to the morning of Friday, so all that remains now to complete the history is to write it down thus: The last day's proceedings were commenced shortly before 10 A.M., of the 21st inst., the business in hand being the unfinished discussion on Mr. Shelton's paper on "The Failure of the Commercial Attempts to Supply Fuel Gas in the United States." As our correspondent remarked last week, this paper is bound to attract the attention, not only of those actively engaged in the business of gas manufacture and supply, but of those who are at all interested in the theory of a cheap fuel gas, and of the authorities of every city of any size, who have been or will be called upon to consider the applications for fuel gas franchises of promoters who speculate in such "fancies." Mr. Shelton has the knack of compiling and tabulating in a way and form so clear and concise that his statements can be readily comprehended, and no words of ours here may be written that could exceed the measure of praise that is his due over his simple (though none the less scathing) arraignment of the fuel gas failures so far made in America. The demand for copies of the paper is such that Secretary Dunbar has been obliged to prepare a second edition of it. The discussion brought out by the paper was a close second in interest to the paper itself, and it is to be regretted that Mr. Burdett Loomis' "indisposition" was sufficiently severe to prevent him from having voice in the debate. Upon Mr. Loomis' shoulders has fallen the apostolic mantle of fuel gas, and many fear that its weight is too great for him. However, be that as it may, he was not well enough to flaunt the mantle's folds in the sight of the Association, who held open the discussion arena for quite awhile, in the hope that Mr. Loomis would have something to say. He need not necessarily have mentioned the recent rebuffs received by him in Cleveland, O., and in Hartford, Conn., for it is likely others would have said on those matters all he would care to hear. In fact, as it was, Mr. Greenough pretty well outlined the Cleveland instance, while Gen. Harbison gave quite an accurate portrayal of the Hartford example. The discussion on Mr. Shelton's paper was terminated and its teachings were indorsed in a decidedly unusual way. We have been reporting the proceedings of Gas Association meetings for a period virtually amounting to 25 years, and the first time that it was our experience to record a vote of thanks to the writer of an Association paper, taken in the "standing order," was at Cincinnati, when the discussion on Mr. Shelton's communication was declared closed. The next thing to engage the Association was the excellent paper by Mr. E. H. Jenkins, of Covington, Ky., on "Leakage," which lead to a valuable, practical debate. The last set number on the programme was read by Mr. H. Wilkiemeyer, of Evansville, Ind., who made out a good case in favor of the proposition, "The Welsbach Incandescent Gas Light for Utility and Economy in Street Lighting." The debate on the paper was lengthy and well sustained, and the gist of it upheld the Welsbach lamp as equal to any fair duty that might be put upon it as a street illuminator. The usual votes of thanks followed, and the meeting was declared adjourned at an early hour of the afternoon. The sessions

and their results were quite up to the Western's high standard. The Association now goes on to its coming-of-age year, rich in a vigorous vitality that must carry it on to greater deeds.

WELL SAID, MR. MILLER.—At the last annual meeting of the Texas Gas and Electric Light Association (our official report of the proceedings of which is concluded in this issue), as we remarked in our first comment on the proceedings, the subject of electric lighting rather monopolized the attention and thought of the members. This, of course, is not to be wondered at, since the separate electric companies of Texas far outnumber the separate gas companies; in fact, the majority of the gas companies are also encumbered with electric lighting annexes. However, although the technical matter presented was on the electric rather than the gaseous side, it by no means follows that the matter was not interesting; on the contrary, it was decidedly interesting. One blot, though, was laid on the proceedings, in that a spirit of levity occasionally cropped out, which levity was altogether too much in evidence in the discussion of Mr. Judge's paper on "A Few of the Many Details of Management." The paper was a commonsense one; in vein quite like its author in personality. In the somewhat discursive discussion that it brought about, a prominent topic was the reliability of electric meters as measurers of current supplied, which topic was blended with inquiries and suggestions as to how a suspected electric meter could be proved as faithful. In the question and answer fusilade that ruled, the gas meter came in for a sharing in comparison with its electric rival or ally, and some very unorthodox statements were made. No doubt the "Battle of the Flowers" had put the delegates in merry mood, wherefore it is presumable that the unorthodoxy noted is to be charged to the spirit of levity that was in the air; but for all that, we wish to, and do, say that President Miller's appropriate remarks, in respect of the staunchness and accuracy of the gas meter as a measurer of the article that it passes, were well and earnestly said. The fact is, electricians may have their own doubts over the reliability of electric meters as measurers of current; but the further fact is that gas engineers have no such dubiousness over the accuracy of the gas meter as a measurer. The gas meter is, in truth, as accurate and as reliable a measurer as a machine can be. It is constructed on the simplest of mechanical principles, it can be proved at any time, its life is a long one (when intelligently handled), and it is not expensive. So it answers every requirement of the company that owns it and of the customer who trusts it. From the foregoing, we do not wish it inferred that we are disbelievers in the electric meter. Quite the contrary is our belief; in fact, Mr. Monroe's contribution to the discussion sounds the note of reason for his belief and of ours. Meanwhile we repeat, "Well said, Mr. Miller."

OBITUARY NOTE, MR. GEORGE TRAUTMAN.—We are compelled to chronicle the death of Mr. George Trautman (since 1885 President of the South Side Gas Company, of Pittsburgh, Pa.), who passed away at his home in Pittsburgh, on the afternoon of the 17th inst. Deceased was born in Birmingham (at that time Birmingham was a borough of Allegheny county, Pa., but it now forms a portion of the city of Pittsburgh), October 25, 1841, and his first connection with business interests was when he engaged with his father, who was a prominent grocer in the South Side district of Pittsburgh. On the death of his father, in conjunction with his brother Adam, he largely expanded the trade transmitted to them, meanwhile accepting business opportunities in other lines that yielded him large returns. Besides his interests in the South Side Gas Company, he was a Director of the Equitable Gas Company, and was largely concerned in the original plans for the conveying of natural gas from the Murraysville field to Pittsburgh. He was heavily interested in many and divers other business enterprises at home and abroad, and his untimely death is mourned by many who admired him as a business associate and who held him in warm regard as a friend. He is survived by his wife, a brother and a sister. The funeral services were celebrated on the afternoon of the 21st inst., the Reverend John H. Prugh, of Grace Reformed Church, Pittsburgh, officiating. Interment was made in the Allegheny cemetery. For the facts in this connection we are indebted to Mr. J. H. Young.

NOTES.—The gas meter inspection ordinance for Kansas City, Mo., has been adopted by the local authorities. The inspector is to have a salary of $100 per month, and he is to have an assistant at a salary of $65 per month. The local Gas Company must pay the wages.——The new holder at the Point Breeze station of the Philadelphia gas works (capacity 3,000,000 cubic feet) is completed.——The Acme Malleable Iron Works, of Buffalo, N. Y., is erecting an absolutely fireproof building (30 ft. wide and 60 ft. long) for the storage of its patterns. The framework will be of steel, the covering of corrugated iron, and the racks for supporting the patterns will also be made of metal. The Berlin Iron Bridge Company is furnishing and erecting the steel framework and covering.

[OFFICIAL REPORT—REVISED BY THE SECRETARY—CONTINUED FROM PAGE 805.]

PROCEEDINGS, THIRD ANNUAL MEETING, TEXAS GAS AND ELECTRIC LIGHT ASSOCIATION.

HELD IN THE MENGER HOTEL, SAN ANTONIO, TEXAS, April 19, 20 and 21.

SECOND DAY, AFTERNOON SESSION.

The President introduced Mr. A. E. Judge, of Tyler, Tex., who read the following paper on

A FEW OF THE MANY DETAILS OF MANAGEMENT.

The success of any business man depends largely upon the attention to details, and, in a great measure, to the personality of the manager. The lighting business is no exception to this general rule. In fact, the manager of a lighting business should be a man of versatility beyond that required in many other lines. He should combine the wisdom of the serpent with the harmlessness of the dove; should possess that happy union of frankness and discretion that will enable him to engage confidence and retain respect. To mechanical knowledge and business acumen he must add a ready apprehension of human nature. This knowledge is necessary to the successful management of his men, as well as his customers.

Many of our electric stations are hazardous fire risks. This might be remedied if the walls are of brick or stone, putting in hydraulic cement floors and metal roofs, avoiding unnecessary use of wood, thereby making them practically fireproof. If this cannot be done we think the station and machinery contained in it should be insured against injury by fire. We do not see any advantage in fire insurance on the distributing apparatus throughout the town, as the risks on it are so scattered that the losses on such apparatus would be less than the premiums on the insurance. We think boiler insurance should be carried, not only for indemnity from damage in case of explosion, but also as a preventive, as the boilers are inspected about three times a year by competent men, and the knowledge that such inspection will be made tends to make the men in charge of boilers more careful. We deem it advisable to carry employers' liability, public liability and horse and vehicle liability policies.

Fuel is a large item of expense, and careful tests of the different available fuels should be made. A check on report of fuel used, where wood is the fuel, can readily be made by taking weekly inventories of the wood on hand in each rick; and we think similar inventories can be easily taken with other kinds of fuel by learning the capacities of the bins and receptacles.

By economizing the use of engine oil, by filtering the oil that has been used, again and repeatedly using. A simple and effective oil filter can be made by using a tank divided into two compartments by a perpendicular partition, putting the dirty oil in one of the compartments, and hanging a strip of cotton batting over the partition dipping down into the dirty oil, and reaching over into the other compartment for the reception of the clean oil and water, which are siphoned over by means of the capillarity of the cotton fiber, nothing but clean oil and water going over, all solid matter being left in the compartment with the unclean oil.

For preventing contract customers changing to other than the contract size of lights, we have a different base and socket for each size, using a T.-H. base for 10 candle power; an Edison base for 16-candle power, and an S.-M. base for 25-candle power, and for all metered lights irrespective of size.

Meters should be tested frequently, as many of them get to running slow.

It should be seen that lights are located as near where work is to be done under them as practicable. Coal oil lamps are usually put near the place where light is needed, making them much more efficient than they otherwise would be, and shades and reflectors are used with them. We cannot afford to ignore these advantages while we have kerosene to compete with.

For determining cost price of material which has been purchased, we find it advantageous to paste all invoices and bills in invoice books, numbering the invoices and bills consecutively, and indexing the name of each kind of article.

In classifying work and collections for ready reference, alphabetical arrangement and indexing alphabetically can be largely used for office work, but for work that requires attention in different parts of the town we prefer to arrange according to route.

Management depends largely on knowledge of the material facts pertaining to the subject and the ability to draw correct conclusions from

such knowledge. To learn facts requires close and careful attention. Classification and a clear knowledge of names and definitions are great aids in rendering knowledge available. As these things require time and attention, and as our available knowledge must be, literally speaking, at our fingers' ends, a manager should economize his time and energies, avoiding unnecessary work, and frequently and attentively examining the various parts of his business.

As to modes of management, one way is shown in a story we read a short time ago in which an inquisitive passenger on a certain railroad system had the following dialogue with an "officer" of the road:

"Do you use the block system on this road?" inquired the passenger. "No, sir," replied the conductor; "we have no use for it."

"Do you use the electric or pneumatic signals?" "No, sir."

"Have you a double track?" "No."

"Well, of course, you have a train dispatcher, and run all trains by telegraph?" "No."

"I see you have no brakemen. How do you flag the rear end of your train, if you are stopped for any cause between stations?" "We don't flag."

"Indeed; what a way to run a railroad. A man takes his life in his own hands when he rides on it. This is criminally reckless." "See here, mister; if you don't like this railroad, you can get off and walk. I am President of this road and its sole owner. I am also Board of Directors, Secretary, General Manager, Superintendent, Paymaster, Trackmaster, General Passenger Agent, General Freight Agent, Master Mechanic, Ticket Agent, Conductor and Boss. This is the Great Western Railroad, of Kentucky, with termini at Harrodsburg and Harrodsburg Junction. This is the only train on the road of any kind, and ahead of you is the only engine. We never have collisions. The engineer does his own firing, and runs the repair shop and round house all by himself. He and I run this railway. It keeps us pretty busy, but we have always got time to stop and eject a 'sassy' passenger. So, you want to behave yourself and go through with us, or you will have your baggage set off here by the haystack."

Some lighting plants, in the past, have been run on the above plan, but we think a successful business will soon get beyond this point; and for necessary work, the manager will avail himself of the services of others to perform such routine duties as they can, reserving his own energies for such work as no one else can do equally well, and for keeping himself up with the essential knowledge.

Discussion.

The President—Gentlemen, you have heard a very interesting paper, and I hope you will avail yourselves of the opportunity now to discuss it.

Mr. Lord—One novel matter to me in the paper is the idea of putting in different sized sockets for different sized lamps. It might apply in Fort Worth or in a town where there are no supply men, but in towns where supply men are selling all kinds of supplies, I don't know how it would work.

Mr. Judge—We furnish all lamps ourselves; we are the only supply men in Tyler.

A Member—How do you test your meters?

Mr. Judge—Of course all new meters have a certificate of correctness; but we have a torsional dynamometer. We tried to test meters in place by using the table of constants and removing the cover, but for some reason it didn't seem to pan out right. Whether it was owing to external currents of air affecting it when the cover was off, I don't know; but anyway it was not satisfactory. Now we test by the dynamometer.

Mr. Cushman—How often do you test, and do you leave the cover off while testing?

Mr. Judge—We take them off to test them. We use the Shallenberger meter.

Mr. Cushman—We use the same meter, and put a glass case over it when testing it.

Mr. Judge—We have no case; we take them to the station for testing.

Mr. Holmes—Mr. Judge says he carries insurance—I think in the employes' insurance.

Mr. Judge—Employers' liability and public liability, and horse and vehicle liability.

Mr. Holmes—I understand that several companies that carried such insurance found themselves sometimes in trouble on that account. A suit is filed against you and you employ counsel to defend the case—you possibly have the company pay the attorney, or you employ one attorney and the company hires another man. Subsequently you might wish to compromise for reasons. You might want to compromise it for a small sum, but the insurance company, wanting to fight the case, refuses to pay anything. They keep the case in court two or three or four or five years. Meanwhile the insurance company goes to the wall leaving you with the suit on hand. I know several instances of that kind.

The President—The insurance was all in the one company that failed, that you know of?

Mr. Holmes—No; in two or three companies.

Mr. Cushman—I would like to ask Mr. Judge how he tested his meters with a dynamometer. How long do you test, and under what conditions. With the dynamometer you get only one test. You can't take off the case and get the time, because you can't see the movement; you say you have no case. You must get only the amount of current flowing through. Do you take the tests for a number of hours, and with the constants?

Mr. Judge—It is a constant; we have a Bristol's recording meter. The variation would not, perhaps, exceed two volts.

Mr. Cushman—How long do you conduct the test?

Mr. Judge—For an hour or more; it seems to me that that is practical.

Mr. Cushman—It is. Do you put more than one meter in the circuit at a time, or do you test a number of meters?

Mr. Judge—One at a time.

Mr. Cox—You can test just as many as you can get in the circuit.

Mr. Judge—We probably would have done so if we had had more than one to test at the same time.

Mr. Cushman—But by every addition the pressure is changed, and your test is not accurate.

Mr. Cox—A wire of ample size is used, so as to render practically negligible the resistance in the circuit.

Mr. Lord—In the course of your tests, about what number were slow and fast, respectively?

The President—Mr. Judge's tests were only on slow meters.

Mr. Judge—Usually when we find it necessary to test a meter, it is on account of its failing; not that it is too fast.

Mr. Lord—You only test when you think they are too slow, and not when they are too fast. (Laughter.)

Mr. Judge—We found that a spider web would stop them.

The President—Those present at our Dallas meeting last year may remember the statement then made that electric meters were as accurate as gas meters.

Mr. Eaton—Having occasion to use power from an electric company in Chicago, I made a great point of testing their meters. I shut the shop down to take inventory, and found that my meter ran right on.

Mr. Judge—I have heard it said that the electric meter is as accurate as the gas meter, and I believe it is. A gas meter is accurate under certain conditions of barometer and temperature, say at 30 in. and 60°; but those are not constant conditions in gas supply. You don't send the gas to the consumer at 60°, and when it varies from that temperature the quantity registered will vary. So the gas meter and the electric meter are about equally accurate.

Mr. Eaton—I want to thank Mr. Judge for his very kind answer to me—that the electric meter means nothing.

The President—I am utterly astonished at the statements made by Mr. Judge, who has been in the gas business for many years. The idea that a cubic foot is not a cubic foot at 60° as well as at 90°, and that the meter is not as accurate at 90° as it is at 60°. We measure the gas in the holder at the temperature of the atmosphere and at the pressure of the atmosphere. We measure it out in that way, and it is paid for in the same way. They pay for it according to the existing conditions of the atmosphere. If we could weigh the gas, it would be a little more accurate than to measure it. When you buy a bushel of potatoes you get a bushel just the same. The conditions that will derange the electric meter are so slight and the alterations so great, that I think it is really a good joke when an old gas man gets up here and says an electric meter is as accurate as a gas meter. He says he found an electric meter that stopped on account of a spider web.

Mr. Judge—Did you never find a gas meter that stopped on account of a spider?

President—No, sir. I think Mr. Judge doesn't mean his remarks seriously. They are in light vein, and should be so taken.

Mr. Monroe—For the benefit of the question asked by Mr. Eaton, "Is there such a thing as a reliable meter?"—

Mr. Holmes—A reliable *electric meter*?

Mr. Monroe—No; I will put it, "Such a thing as a reliable meter." Is there such a thing as a reliable man? Is there such a thing as a reliable watch—no matter what it be; is there anything reliable? If there be, there most assuredly is a reliable electric meter. If any of

the bases which you term electrical principles are accurate and we have every reason to believe them accurate, or our whole system would be inaccurate, then the meter is accurate. When the meter is first put into service it can be tested by every means known to the electrical fraternity and proven to be accurate, and with proper attention—and shall we say there is any piece of machinery that needs no attention—it can be kept so. That electric meters are occasionally found inaccurate is the fault of the station men principally, in putting the meters in places where they receive no attention. After placing they are allowed to run on and dust accumulates in them, with the result that inaccuracy ensues, and the only remedy is to take the meter out, substitute another for it, and repair the defective one.

Mr. Eaton—I asked my question in perfect seriousness, without any thought that the matter would be lightly treated.

Mr. Judge—In reply to the President, it was the practice in the State of New York to consider the gas meter that was 2 per cent. fast or 3 per cent. slow as correct.

The President—Two per cent. either way is the current New York practice.

Mr. Judge—They vary that much, I suppose, owing to the difficulty of securing closer accuracy. Of course, a meter regulated to register a cubic foot of gas will register a cubic foot, but the consumer, so far as the light giving powers of the gas are concerned, gets less of the actual mass of the material when it is measured at a higher temperature. What he is after is the "stuff," and not simply the expanded mass.

The President—That brings us to a subject that I have been fighting for for years. People should respect "the rights" of the gas meter, and not put it out on the porch, where it is warmed in the summer time and cooled in the winter time. When it gets hot the gas is rarefied, and occupies so much space that it is not serviceable, and in the winter time it gets so cool that it sometimes registers without even going into the pipes. Every man should insist on having the meter put where the air is, as far as possible, of uniform temperature all the year round. There will then be less trouble to the gas man and less trouble to the customer, and both will come nearer to obtaining value for their money.

Mr. Cox—I will leave the gas meters for you gas men with this exception: In comparing an electric meter with a gas meter, the gas meter has been developed and perfected to such a degree that, after you make your connections to it and from it, I think it is absolutely impossible for any extraneous matter to trouble or affect it. Unfortunately that is not so with the electric meters on the market to-day, and while I heartily agree with the gentleman in regard to the position of the meters on the premises of the consumer, I hardly think that that can relieve the manufacturers of the meters from making them practically air tight. As to the testing of electric meters, I have been connected with some of the largest factories, and knowing their inside methods, I will state them. A meter is tested for amperage by the usual methods of the known quantities by the ampere and volt meters. That meter is placed on a meter testing stand with, as near as they can get at it, an air tight case having an opening so it can easily be seen. On the side running along the line are spaces for from 10 to 20 meters in a series. All these meters with a corrected meter are run together on a lamp glow for different periods, usually about an hour. Then they are examined for averages, and those meters which are not registering within two per cent., either above or below, are rejected and sent back. For central station work the same practice can be very easily followed. On applying to the factory they will send you an absolutely correct meter that can be suitably arranged on a testing stand, and the meters can be hitched up the same as in the factory. That will eliminate all errors that are apt to creep in from the inaccuracies of the dynamometer of which Mr. Judge spoke, and of any of the testing methods by constants as well. If there is such a thing as measuring current, then there is such a thing as having an accurate meter.

Mr. Judge—One point in regard to meters becoming slow. Many meters will continue to supply the light, when they will not register. A 20-ampere meter will pass current to one light without registering it; but when two or more lights are turned on registration will take place. The only way to get at the standing of such meters is to bring them in occasionally and examine them. A customer can burn a hall light in his house right along without any registration whatever for the time that light is burning. Many meters are in that condition, we have found.

Mr. Cox—That only applies to the ampere meter; the Shallenberger or the Duncan will record it. You will find that the ampere meter is the best.

On motion of Mr. Cox, a vote of thanks was passed to Mr. Judge.

A DIP INTO THE QUESTION-BOX.

The President then announced that the Association would take up the Question-Box. The Secretary thereupon read:

No. 1. "Can any member state as a fact, from actual experience, whether the power of a 16-candle power lamp is increased from 16 to 22 candle power, at expiration of 150 hours' burning, and to 18-candle power at 350 hours. Note the attached chart showing the claim of some manufacturers of lamps."

Mr. Monroe (after examining chart)—Is this an actual chart?

The President—No; that is a claim. I think it was made by a party representing the company.

Mr. Monroe—The only actual test would be to make it with a photometer. It is an actual fact that any incandescent light raises above the candle power from the first, and then gradually decreases. Just what that amount would be would have to be determined by a photometer test. I don't think those figures could be stated as accurate, until after a photometer test.

Mr. Cushman—I would like to ask Mr. Monroe if that condition exists after the actual voltage of the lamp for which it was made is established?

Mr. Monroe—Yes, sir.

Mr. Cushman—If the voltage was above the normal, what is the condition?

Mr. Monroe—If the voltage was above normal, the candle power would still rise very slightly, but not so much. For instance, a 16-candle power lamp will burn to probably 18 or 20 candle power, if it be, say, a 110-volt lamp. Should we put a 113 volt lamp in there it would not raise so high, although there would be a slight raise, but this raise is due to the fact that the lamp is not up to candle power at the start. If a 110-volt lamp is put on a 110-volt pressure it will go up more rapidly, but will not last for 300 hours.

Mr. Lord—I put that question in the box. The advertisement of a company showed their lamp increased to about 22-candle power, and I doubted it.

Mr. Monroe—If you noticed the curves I exhibited yesterday you will notice that every light will raise at the start. If a lamp raised so high it would drop very suddenly, and wouldn't be of much service. It would not be a good lamp to use.

Mr. Lord—They claim this does not drop below 16 at the expiration of 600 hours. If the candle power would only fall to 16 at the end of 600 hours, it is a very favorable lamp.

Mr. Cox—From the curves shown here, that lamp running, from 16 to 22 at 150 hours, might be the result of one lamp, and not the average of many. They sometimes do come out that way. Here is another curve, starting at 16, and rising to 175 hours, where it is 19-candle power. That would be about the normal condition, as Mr. Monroe explained in his paper yesterday. For my part, I say no such lamp is made.

No. 2. "Why is it that transformers in isolated districts are injured by lightning more than in the business portions of a city?"

Mr. Cushman—I think it is due to the protection of the lines and converters from metallic wires used in other conductors with heavier charges of electricity in the central portion of the city than in the outlying districts, which have not such conditions.

Mr. Cox—I think the best known authority on lightning is Mr. Werz. The Westinghouse Electric and Manufacturing Company will send to anybody a copy of Mr. Werz's lecture on lightning arresters; and while I don't want anyone to think I am trying to boost the Company named, I must say that lecture goes very fully into the subject of lightning and lightning discharges. I don't know whether anyone here ever conducted any experiments in static electricity, but the experiment can be very easily made. Mr. Werz two years ago, before the national convention of the Electric Light Association, went into this subject at great length, and his studies go to show that lightning arresters, to the number of not less than four to every mile, should be placed in every line.

Mr. Lord—Our circuit, known as No. 1, which goes out into the isolated portion of the city, has the arresters six to the mile. I thought we had them in pretty thick, but we "get it in the neck" right along. We dig a hole 6 feet deep, put about a ton of gas house coke into it, fill it with water and cover it up, and that retains the moisture in the ground.

Mr. Cox—Have you tried the choking coils?

Mr. Lord—No, sir.

Mr. Cushman—Some years ago we had considerable trouble in Fort Worth. They stretched lightning arresters, made out of ordinary barbed wire, on every fifth pole. The theory was that the lightning

would seek these points and, going down to the earth, wouldn't bother our plant. When we got to running, every storm that came burned out every armature. I cut all those lines down, and then our trouble began to cease, and not until then. We took the ground wire away, as it seemed to draw all the lightning to it.

The President—As Mr. Cushman has referred to the Fort Worth electric plant originally, it was my pleasure to be manager of the Fort Worth gas plant when that plant was started. I made it my business to go around and warn everybody about the danger of lightning from incandescent wire. My competitor, Mr. Walerich, came out with a half page advertisement which in very large type displayed this sentiment: "It is utterly impossible for lightning to strike our incandescent lights as our lines are heavily insulated." A few years later, after the two companies were consolidated into one corporation, I was joking Walerich about the statement he made, and asked him if it were true. He said "No, hang it, every bit of lightning in the country came down into the central station."

Mr. Cushman—He was right about it.

Election of Officers.

The President announced that the election of officers for the ensuing year would be the next business in order. The elections were made by open ballot, the official tellers reporting the results. The officers chosen were:

President—Mr. L. T. Fuller, Calvert.
Vice-President—Mr. J. C. Lord, Fort Worth.
Secretary—Mr. W. E. Holmes, Austin.
Treasurer—Mr. Fred. Fries, San Antonio.
Executive Committee—Messrs. J. R. Cullinane, L. T. Fuller, T. D. Miller, J. H. Fitzgerald, G. H. Cushman, A. E. Judge.

The officers-elect having responded suitably to the promotion conferred upon them, the Secretary read a telegram from Mr. L. J. Christen, Mayor of Laredo, Texas, inviting the Association to hold its next meeting in that city. The Secretary was instructed to thank the Mayor for his kind offices. A lengthy discussion on the official organship then took place, which resulted in the passage of a resolution to repeal and lay upon the table that paragraph of the report of the Executive Committee which recommended that the *Electrical Engineer* be made an official organ of the Association.[1] The Association then adjourned, to reassemble at 9 A.M., April 21st.

Third Day—Morning Session.

The President having called the meeting to order, introduced Mr. J. D. Oliger, of Cleburne, who read the following paper on the

OPERATING EXPENSES OF ELECTRIC LIGHT PLANTS.

In submitting a paper on the above subject I will confine myself principally to plants of such size as I have been, and am now, connected with, viz.: 1,750-light Westinghouse alternating current dynamo; 90-horse power simple non-condensing Russell engine; 100 horse power Russell boiler.

Operating expenses can be run on an economical basis, but good common sense and judgment must be exercised from office to coal scoop. The manager must be a practical business man as well as an electrician, or one who will devote his entire time and attention to his business; at all times giving his patrons good service, and above all trying to retain the good will of the "City Dads"; for it is a well-known fact that in being at "outs" with the above gentlemen much trouble can be caused to the management, as well as expense.

As the coal pile is one of the most important items to any plant it is one that should be watched at all times. Secure a good and economical fireman, one who is "on-to-his-job," and pay such a man a good salary, as this kind of a man will look after your interests at all times.

Secure a good man and one that can fill the place of superintendent and engineer, as much can be saved by securing such a man—one who is a practical engineer as well as an electrician—and one who understands his business in all details, both mechanically and electrically. Any plant (if of the size referred to) can be run successfully with three men: (1), secretary and manager; (2), superintendent and engineer; (3), fireman and assistant engineer.

Let your superintendent work from 11 A.M. to 11 P.M., wiring in new lights and making such repairs as are necessary in order to keep plant in first class condition at all times. Let superintendent and engineer take charge of plant at starting time and run same until 11 P.M., with the assistance of fireman. Let fireman take charge of plant after 11 P.M., and run same until closing time. This plan will give entire satisfaction, as well as showing a very economical pay roll.

Much can be saved by filtering your oil over a number of times, for in this way a barrel of engine oil can be used from 7 to 8 months; cylinder oil, 11 to 12 months. Above all, use large wire to prevent loss on lines, and this will save coal pile as well as bring lights up to proper candle power. Do away with small transformers and arrange to use one large transformer for each block. Coil transformers give the best results, and will stand much more lightning than the old style.

It is a well-known fact that a number of good lamps are on the market, and no doubt every superintendent and manager has his preference; 3.6-watt lamps are used oftener than any other, but recent information shows that a few plants in this State are now using a 3-watt lamp. Such plants, however, must have perfect regulation, otherwise the lamps will not yield the desired life.

Discussion.

The President—Mr. Oliger's paper is open for discussion.

Mr. Yaeger—Mr. Oliger seems to have covered the field of management of the small plant so completely that nothing thereon is left for our discussion. His suggestions are all good.

On motion, a vote of thanks was passed to Mr. Oliger.

The President—Owing to the lateness of the hour, unless there is some objection, Wr. W. L. Hall's paper will be read by title, the paper to be published in full in the official report. This was agreed to. The paper by Mr. W. L. Hall (of Mexia, Texas), bore the title of

THE STORAGE BATTERY AS AN ADJUNCT TO SMALL ELECTRIC LIGHT PLANTS.

and is as follows:

Last October I received a communication from our Secretary informing me that the Executive Committee of our Association had assigned to me the duty of preparing a paper on the subject of "The Storage Battery as an Adjunct to Small Electric Light Plants," to be read in this convention.

My inclination at once prompted me to refuse this honor. Duty, however (which is even hard to those consciously capable of performing it well, and a thousand times more difficult to those possessing an equally sensitive consciousness of inability), obliged me to accept this commission. In accepting, however, I reserved the privilege of roaming capriciously over my subject—selecting the topical instead of the technical branches of this question, and I must ask the same indulgence from the convention. My object in prefacing this paper with the above, and what is to follow, will be made apparent to those who will care to notice the vast difference in responsibility between the topical and a technical position. The latter confines me strictly to the expression of results by figures, while the former allows me the expression by fancy, as well as by figures; and the excuse which I feel called upon to make for taking the former position is the fact that my location and labor for the past year have rendered it quite impossible (without the expenditure of considerable money and time—both of which I could ill afford) to collect the amount of technical data necessary to render a special treatment of the storage battery subject either interesting or instructive. Besides, in the preparation of a technical paper on any subject of applied science, which is in any sense calculated to encourage a particular system, is provoked a volume of criticism which must be defied, and unless one is armed with the power to express results by figures and with the consciousness of truth that a long period of successful investigation brings to your assistance, your efforts will naturally result, as they should result, in injury to the cause you represent and confusion to yourself.

By the foregoing remarks, however, it is not my purpose to raise the inference that my subject is in itself void of technical truth and strength; for, on the contrary, the storage battery as a palpable entity is forging to the front in the minds of the great economists of the age, and its character and success are evidenced by the recent large investments made by some of the principal central stations of America. As you have all read in our journals of these investments, and have no doubt given the matter considerable thought, you will kindly mark my prediction that, if the inductive theory of reasoning can be harmonized with the conducive principles of industrial advancements, the time is not far distant when you will no more consider that an electric installation is complete, for purposes of flexibility and pecuniary results, until you have separated your system into two great divisions, distinct and apart from each other; one you will call your generating department, the other your distributing department. We, as the conductors of isolated lighting plants, have heretofore never considered that a distinction was possible or was even called for. We have never considered

1. This action makes the American Gas Light Journal the only official reporter of the Association.

there was such a thing as a distributing department connected with our work, and not without obvious reasons. All the energy of the great men who have contributed to the immense results accomplished in the electrical sciences in the past 20 years, and all the money expended on lines of investigation, have been directed towards the accomplishment of grand results in generation.

Only two notable events have transpired in the commercial history of electricity to give character to this much neglected department of distribution. One of these events transpired when, in 1878, Mr. Thomas A. Edison announced to the world his system of dividing a given current of electricity into numerous subdivisions, supplying as many lights of moderate candle power, distributed throughout a considerable extent of territory, instead of one light, as had been the previous custom, of intense brightness at one central point. This event proved the commercial birth of electricity, and proved also the birth of our department of distribution. Like all grand achievements of sufficient weight to disturb the balance of the scientific world, the discovery by Mr. Edison had a tendency for some years to prostitute the genius of the age. Great men had labored in the field of electrical investigation prior to Mr. Edison's announcement of his principles, and many pieces of apparatus for the generation of current had been devised and built, but this was the first score of success for distribution. I say that the genius of the day was prostituted because the glaring weakness of Mr. Edison's perfected system, which was then the marvel of the world, must have been as apparent to the great economist of that day as of this, and still the great minds of that day seem to have considered that everything had been accomplished except in the line of imitation.

All available capital in both the old and new world was diverged from its usual channel and at once placed at investment, either in the manufacture of electrical apparatus or the development of electrical enterprises. The result of all this energy, the investment of all this capital, has been that, in the short period since 1878, there has been expended in this country alone in the electrical industries an amount something over $1,680,000,000, which is in the ratio of about $24 per each inhabitant of the United States, and electricity has grown to be one of the chief necessities of our lives. Yet those same glaring weaknesses which characterized the distribution of current in 1878 remain with us still. Remarkable things have been accomplished by the expert designer of electrical dynamos and apparatus, by the expert designer of power and machinery in accomplishing a very high per cent. of proficiency in the generation of current. Indeed, I think the claim is made by some one of our leading builders that they are now able to deliver to the patron 75 per cent. of the energy contained in the combustible matter used as fuel. Aside from the assumption that this claim of experience is based upon the measurement of the light or heat units delivered, I have neither reason nor inclination to doubt the truth of this claim. I simply wish to make the point that to those more nearly interested in the distribution of current than in its generation the results accomplished by our builders have no direct application to the necessities of our condition. That a difference in the efficiency of the lamp, or in dynamo electrical apparatus, of 10, 20, or even 50 per cent., makes no perceptible difference to us, as long as there is the inherent weakness in our system of distribution which characterized the ordinary plant of this time.

It is safe and conservative to estimate that all the electric plants constructed upon the principle of direct transmission are either idle or operating at a loss 85 per cent. of the time, which leaves only 15 per cent. of mean effective time on which to depend for your net returns. This result is the perpetration of one of the many fraudulent inconsistencies to which our patrons are subjected, which, in turn, results in an extravagant waste of current that contributes more than all other things together towards the failure of our electrical enterprises. The fraud to which I refer consists in charging our patrons by the old and ruinous system known as flat rate. The principle of this system consists in charging like rates for unlike services. A person whose business contingencies require the use of his lights for 2 or 3 hours during each day is required to pay the same rate per light as the man whose business calls for the use of lights for 8 and possibly 10 hours. There is no inducement whatever for your customer to economize in the use of current, with the possible exception of the doubtful policy of charging excessive rates for lamp renewals. It is, therefore, reasonable to estimate that of the load which your machine carries between the hours of 10 o'clock in the evening and the closing of your plant in the morning no more than 5 per cent. is in any sense useful to your patrons. Therefore, the remaining 95 per cent. is an absolute waste, and, in addition, there is a very large per cent. of waste current representing your early load, which is perceptible and can be estimated by installing meters.

It is not my purpose in this paper to discuss the merits or demerits of the meter. I mention them in this connection simply to give authority to certain figures which I could not well avoid, in illustrating the conditions which surround the electrical industries and the pressing necessities for making a change in our methods of doing business.

Now, to again refer to those figures. We find a direct loss in current during our 15 per cent. of mean effective time, which is represented between the hours of starting the plant in the evening and the closing of business at 10 o'clock, of at least 20 per cent., and the balance of time during the night run there is a 95 per cent. extravagant waste in consumption in addition to a 75 per cent. loss in time. The time lost I refer to is due to running your machinery at light load, and besides, and above all, from 10 to 16 hours of each day your plant, remaining closed, does not pretend to do anything in the line of production. But what is important to mention is the fact that during these hours of idleness your expense account continues active. Live enough are your interest, depreciation, and labor accounts; also, an expenditure of fuel account. And, with the exception of the latter item, they are as excessive by day as by night; yet our present system does nothing to relieve this condition. As I stated, millions of capital have been invested in perfecting the efficiency of the dynamo, the engine, and the general station equipment, leaving its success dependent upon its novelty more than its character. While this broad field of distribution created by Mr. Edison in 1878, vastly extended in possibility and character by Mr. Faure in 1880, remains, with a few possible exceptions, as Mr. Edison left it, limiting the effective force of my investment to an extreme of 20 per cent. of its normal capacity, qualifying the small percentage of the residents of my community who patronize the electric plant as men patent in their encouragement of public industries and with means to justify a luxury.

I think I am not wrong in stating this matter as above. Our little town of Mexia has a property-owning population of 426 persons within the corporate limits. Of this number at least 300 are in good pecuniary condition, and, if they could reasonably do so, would patronize our Company, either for lights, power or heat, as they might require. In addition to the above are those residents in the neighborhood of Mexia who should be reached under more favorable conditions. These would swell my patron list to 400, and situated thus, under conditions of remarkable promise among a people always anxious to contribute their influence to aid progress in its efforts to benefit the human race, and especially in the upbuilding of our own community, a brief statement of our business history is as follows: Two years ago our plant was started, with a patronage list of 34 names, representing 387 16-candle power lamps. At the end of our first years' service I find that our patronage list was equal to 62 persons, representing 623 lamps installed. This list continued for some time to remain stationary, and I lost faith in my power to build up my plant to any further extent until our Company decided to change to a meter basis. This has had the result of increasing our patronage list to 72 persons, representing 785 lamps.

Now, my object in referring to this item of domestic history is that I may find some authoritative basis upon which to establish the statement following: That my Company has invested a considerable sum of money in an enterprise of doubtful character and uncertain future, depends upon the most favored conditions of our commerce for success, and while in equity it stands as a public enterprise, it has no such standing in fact, and continues, by force of circumstances, to supply an extravagant luxury to about 20 per cent. of the people of my community who represent actual property owners. Our enterprise is doubtful of character, not owing to the fact that there is no grand future of electrical development, which will surpass in brilliancy the electrical period through which we are now passing, but for the fact that we are living in an age which marks the infant period of electricity, and our plant is constructed along such crude lines that we have no choice of success. To those whose money is invested in the manufacture and sale of electrical energy who have failed to study this question from a standpoint other than is suggested by present methods, the gloom is thickening year after year, and their expectations fail of realization. Hope, which "springs eternal in the human breast," starts them on the new year, but I marvel that they carry their accumulated load of disappointment to its end. My simile is no exaggeration. There is something wrong.

My main justification of this statement is the fact of this convention. Our meeting is for some purpose other than social. I notice representatives here from all parts of our State, and my judgment tells me that this congregation could not be assembled from motives less urgent than the preservation and improvement of the industry which we are here to represent. If improvement is our subject, it is well that we

arrive, first, at an agreement as to what we want improved, and then, in a systematic way, unite our efforts with this improvement in view. To the close student of economic principles as applied to the electrical industries, and to those thoroughly familiar with present methods, there will appear a great many things to be improved in our present system of delivering our product to the consumer. They will simply differ as to the importance of these improvements, and if this convention takes issue with me in any position the difference will rest, not upon the fact of the items I propose to state which trouble us, but upon the degree of importance which I propose to attach to them.

A disability which I consider as being the most important for us to take under advisement, and which merits first place among our troubles, which has already been referred to in this paper, is our idleness. This I have placed conservatively at 75 per cent. of our total time. I think that so far as this item is concerned, there will be no question raised.

The item to which I concede second place in importance is the fact that our present systems are not constructed with the view of possibility of covering any but the least of four divisions which constitute our labor; namely, power, heat, light and current for scientific purposes. I have also probably mentioned these elements in their natural order of importance. During 3 hours of each 24, everybody will require lights, and for another 3 hours a small per cent. of our people require them. With power and heat, however, it is quite different. These are factors that constitute the main elements of our social and business life and almost as much a part of ourselves as the atmosphere we breathe, and our electrical companies must turn their attention to this field and win it, in which event we will have no idle time to eat the earnings of our plant.

The disability which I place third in importance, as hindering the progress and pecuniary success of our electrical enterprises, is the fact that our rates are very much above the charges of supplying light, heat and power by other methods. This must be considered to meet contingencies, or our competitors will reap the harvest.

I think our next main difficulty lies in the unreliable character of our service. Our patrons never feel absolutely certain that they can depend upon our supply of current. An establishment may be crowded with customers in the act of purchasing goods, and, without the slightest warning, they are plunged in darkness. This darkness may continue five minutes; it may continue one hour, or a night; but in any event long enough for him to sustain an incalculable loss. He is not provided with other methods of lighting in this emergency, for the very reason, likely, that our preceding month of good service gave him no warning. Our supply of current is dependent upon too many pieces of mechanism to be reliable. There are too many causes to be watched. Our plant is lacking in flexibility.

In addition to the troubles enumerated above, there are many others of less important character, among which is faulty regulation, which induces variable pressure, and that in turn impairs the life and efficiency of the distributing apparatus and endangers your general plant However, it is not the purpose of this paper to treat this part of the subject in detail, and I think it is sufficient that I have mentioned undoubtedly the four great obstacles, viz.: Idleness, rigidity, high rates, and the unreliable character of our service, standing more effectually toward barring our way to progress and success than all things else together.

I think that no other labor is so worthy of the attention of our Association as the removal of these disturbing elements in their regular order. Upon investigation you will find this to be a considerable undertaking, or, at least, it will appear to be. We must take into consideration the necessity of making considerable change in our systems of conducting our business. This change must have in view the separation of our generating from our distributing department. This first step will pave the way and make the accomplishment of all other purposes easy. It is evident that our generating department represents the expense side of our business and that our distributing department represents the income side of our investment; therefore, it should be our purpose to operate the former the least possible number of hours in the 24 and the latter the greatest number. At present this condition is reversed. Most of us are compelled to operate our generating plant on an average of 12 hours, while the work of our distributing department covers no longer a period than 5 hours. This is a manifest weakness due to the rigidity of our direct transmission systems, which do not allow the operation of one independent of the other. This must be accomplished before we can hope to make a success of our work.

We must arrange our system of distribution in such a manner that not a particle of current will be delivered without an equivalent return in money from the customer using it. That we may deliver at all times, either day or night, and for any purpose that it may be required, in small quantities as well as large, in any pressure free from variation, constant in all its conditions, and it must not depend for quality upon the number of revolutions your armature is making at the station. It must not depend on the carelessness of a poorly paid station attendant, nor a multitude of delicate appliances, the disarrangement of any of which is sufficient to disrupt your service. We must be prepared to deliver at any distance from the station, which delivery must not depend on a network of wire pendent in the usual way from poles along the highway, every part of which increases the liability to trouble and effects its share of loss in the transmission of the current. Let us profit by the example of the water company and the gas company, who are meeting with a considerable measure of success in the conduct of their affairs. Let us construct a system of storage for our surplus products and keep a considerable reserve of current constantly on hand to meet the emergencies of our service. What character of competitor would we realize in the gas company, provided they would attempt a supply of gas direct from an engine as we do? What would we think of a water company which would attempt to supply water direct from their pumps? When the pumps were interrupted, our water supply would stop. Would not this be a very crude system? Don't you think the fact that we do business on this same crude principle is the reason that in cases where we secure 72 patrons in a community the Waters-Pierce Oil Company secures 328. If there is reason in this supposition let us take this matter under serious consideration at once, find our remedy and apply it. Let us construct our storage systems and thus provide an opportunity to employ our idle minutes. Let us connect our patrons with this storage reservoir, instead of connecting them direct with the terminals of the dynamo.

We have now reached a season of the year when our entire output of current for the 10-hour run could be generated at full load in less than four hours. This system will give us the advantage of operating our generating department just long enough to supply the demand for currents and the privilege of operating our distributing department for the entire 24 hours of each day. At Mexia we consider that our plant is loaded to its full capacity, and are unable, without first installing more machinery, to handle new service; but this calculation is based on a 4-hour's run. If I would install a storage battery auxiliary, that could be utilized during light load and idle time, it would increase my present capacity in the ratio of my increase in hours of run. In other words, if I am now supplying current for 2,255 lamps, and if I could run my generating plant for 16 hours during each 24, I could supply current for 3,140 lamps, equal to an increase in my present plant to four times its normal capacity, and at a first cost of less than one-half the cost of installing machinery and apparatus for making this increase in capacity by the ordinary methods.

Would this system not justify a considerable reduction in rates to meet equitable demands? Would this system not open a vast field for the supply of current for power, heat, additional lighting and scientific purposes, that our present conditions and rates remove a long distance from us? Is it not reasonable to suppose that my plant would find service to employ its idle moments profitably? Would not our patrons appreciate a system upon which they could place absolute reliance at all times? A system which would furnish them light at a reasonable cost, even on a dark, stormy day, when in most business houses they require light almost as much as during the night, a system whose regularity would increase the life of their globes at least 100 per cent. Is it not reasonable to suppose under these conditions that electric force would so combine itself with the very fibers of our social, business and political institutions that it would become an indispenable factor?

Let us direct our attention to that system which will enable us to deliver our produce beyond that limit which is considered the extent of economic delivery by wire, and cover that vast field that extends beyond our present lines of operation, and also that still larger field which lies within our present boundaries, but is removed from us by the crudities of our present system. To give some data with reference to the character and fact of this latter field, I will mention that, a short time previous to the preparation of this paper, I made a somewhat hurried canvass among our patrons, and ascertained that, if my company were prepared to give service during the day, and furnish current consistent with the requirements, we could sell additional current to the following extent: For the maintenance of 28 all day lights; 48 fan motors, two 2-horse power motors for printing offices; one 3-horse power for a manufacturing company, the electrical equipment for one dental establishment, and a moderately well-equipped surgical and scientific laboratory. My town is not large, but I feel confident in pre-

dicting that when our company can demonstrate that it is within our power to satisfy this demand, it will be very much increased above this list. There is no question but this field is large, and that it will prove profitable. Why not equip our stations with a view to handle this trade? Our surplus product and idle time will amply provide this current, provided we can store away our waste current and make a provision for utilizing our idle moments in work. Then let us make provision for the construction of storage reservoirs, the same as the gas company provides its gasometers, and the result will prove as satisfactory to us as it has to them. The gas companies could not think of operating without their gasometers; how can we operate without our storage battery auxiliaries? There are those in this convention who are prepared to make a distinction between the gasometer and the storage battery, based upon various conclusions, among which will appear that the gasometer is a part of the generating plant of the gas company. In the sense I claim it does not bear the same relation to the gas company as does the storage battery to the electrical plant; that the storage battery does not prove the justness of my comparison, but its acceptance in general use; that the cost, maintenance and character of the storage battery are not sufficiently defined quantities.

Many other objections I pray the convention will not hold me in duty bound to answer at this time, for they belong more properly to the technical side of this question, which it has been my care to avoid. However, to those who are inclined to look forward with me to the improvements the future holds in store in methods of conducting business, I will state that the economists of Europe will not deny the parallel. They would not admit that one is complete without the other. One of the apparent results to them is, that while fuel is much higher than in this country, the price of skilled labor being equal, the small plant in Europe is enabled to distribute current at a much lower rate than is its prototype in this country, and on a more profitable basis to the company. Nor is this principle confined entirely to Europe, for great activity has ruled among the large station managers of this country during the past two years in the construction of the storage battery auxiliary. Notable instances are the investment by the Boston Edison Company, the Chicago Edison Company, the Bowling Green Edison Station of New York, and several other New York companies, one of which proposes that, by the end of the present year, they will have installed a sufficient auxiliary plant to carry its entire load for a period of 75 hours, if the necessity arises. The Bowling Green Station installed last year a sufficient battery station to carry 30 per cent. of its maximum load and permit the closing of the Duane street station during hours of minimum load, thereby effecting an immense saving in operating expenses.

I could mention numerous instances of this kind, were such evidence required, to establish the character of the storage battery as an investment. Such will not be necessary to my purpose, however, and in closing this paper I will confine myself to anticipating a few of the objections which may be urged against the practical application of the storage battery. The first objection will be the great space it occupies; the second objection, its weight and cost of handling; the third objection, the current loss in charging and discharging; the fourth objection, the high maintenance cost. To the first of these objections I will probably not be required to answer in this convention, as space to the people of Texas is an unknown quantity, and will therefore not be regarded as a serious objection. However, for the benefit of those who may dwell upon this feature, I will state that the type of battery constructed and placed on the market by some of our leading manufacturers can be contained in a space a little larger than 4 cubic feet, and will have the capacity of discharging 8,400 watts in work—this is equal to about 2,000 watts to the cubic foot. Regarding the second objection, I will say that I am at least willing to admit the inconvenience of this feature and its cost, provided there is no special arrangement devised for handling; but even if there is no very elaborate arrangement made for this purpose, I am prepared to state that this matter of weight will not be a serious consideration. By any process of calculation, the little more than 4 cubic feet of cells referred to above having the capacity of discharging, with one charge, 8,400 watts in work weighs but 672 pounds, or 12½ watts to the pound; about 6 ampere hours to the pound. In other words, 4 pounds of cell is capable of discharging current to maintain one 16 candle power lamp of moderate efficiency for one hour. This is not much greater than ordinary weight of transformers in present use.

In regard to the next objection, current loss in charging and discharging, I will state that these losses can be estimated in the aggregate at 20 per cent., and are due mainly to the resistance introduced into the exciting circuit of the dynamo on account of the too weak resistance of the electrodes of the batteries. There is scarcely any loss in discharging. Any good make of modern storage cell will discharge 95 per cent. of the energy put in the cell. This statement is amply justified by the reports of leading investigators, and if it is correct that 75 per cent. of this 20 per cent. loss is due to the mechanical contrivance used designedly in the process of charging the batteries, circumstances will demand, and necessity will design, its removal when the proper time comes. But in the event that I am wrong in this, and the 20 per cent. loss is destined to continue for all time to be the subject of our regrets, what will it amount to, compared to the disabilities and even losses incident to our present method of doing business? Will this 20 per cent., even considered as additional to present losses, compare favorably with the 85 per cent. loss of time units giving notorious character to present electrical plants?

Now, with regard to the high cost of maintenance, I will say that this is no longer a feature of the storage battery problem, from the fact that some of our leading storage battery concerns, in the sale of batteries, will grant the privilege to manufacture plates and all accessories, or will guarantee a maintenance of 5 per cent. on the investment. I think that the manufacturers of the American accumulator will guarantee all plates for a period of two years.

Either of the above arrangements would render the cost of maintenance a matter of small consideration. However, no objection can be urged against the storage battery which should delay a thorough investigation of its merits and application to small lighting stations, and I think the subject one of such grave importance that our Association should make it a matter deserving its special attention. If our constitution does not already make provision of this character, I think the first duty of our convention should be its alteration to permit the selection of a standing committee, whose duties shall consist in making a thorough investigation of this and other subjects which might be suggested by actual and practical demonstrations in this line of work, and in this I think the Association will accomplish the greatest benefit to its members.

The Question Box Again.

The President announced that the contents of the Question Box would next be disposed of. The Secretary read

No. 3. "What is the lowest, what the highest, and what the average price at which gas is sold for fuel purposes in Texas?"

Mr. Fitzgerald—At Houston the price is $2, and we have a proposition now to reduce to $1.50. I believe Galveston is selling fuel gas at $1.50. What the highest or lowest rate is I could not say. Mr. Lord's communication before the Association, stating that the rate at Fort Worth is $1.33, is, I believe, the lowest rate in the State.

No. 4. "What are the methods employed and success attained in the introduction and use of the Welsbach gas lamp?"

The President—We have about 4,000 Welsbachs in Dallas. The lamps are sold, as many of you no doubt know, at the prices fixed by the Welsbach Commercial Company. The success of the burner, I believe, is no longer questioned. The only drawback is the delicacy of the mantle. We find the best way to maintain the mantles and keep the lamp burning in perfect condition is to have a man whose duty it is, first, to see that all Welsbach lamps in town are kept in good condition, that the adjustment of the air and gas is just right to make a perfect light, and that all mantles are renewed when necessary. Of course, it is dependent largely upon the willingness of the owner of the lamp to pay for a new mantle, but, as Mr. Monroe stated in his paper about the incandescent electric lamp, it doesn't require much argument to convince a man that it is money in his pocket to keep the mantle in good condition, because he is getting his money's worth. The usual rating of the life of a Welsbach mantle is about 1,000 hours. Repeated tests show that a Welsbach burner rated originally at say 60 or 70-candle power will give a candle power of 27 at the end of 1,000 hours. They will not all do it. One mantle in Dallas, used every night until about 11 or 12 o'clock, for three years, showed a life somewhere in the neighborhood of 10,000 hours. I think it gave 30 to 40-candle power at the end of that time. It would probably have been burning still, but for the fact the firm moved, and in moving the mantle was destroyed. We have inaugurated in Dallas a system of maintaining lamps at so much a month, according to the number of lamps in use. Where they have installed the Welsbach lamps we contract to keep the mantles in good condition, to clean the chimneys, and keep the gas supply adjusted so as to give good light, for a stipulated price according to the number. This gives satisfaction to the Company and to the consumer. At the prices we are getting we are about whole on the operation. After awhile we hope to get more and be able to maintain them at a still less price. The rate for the ser-

(*Continued on page* 869.)

[Official Report.—Revised by the Secretary.]

TWENTIETH ANNUAL MEETING, WESTERN GAS ASSOCIATION.

Held at the Grand Hotel, Cincinnati, Ohio, May 19, 20 and 21.

First Day—Morning Session.

The Association was called to order by the President (Mr. W. H. Odiorne) at 10 A. M. of May 19th, who introduced the Hon. John A. Caldwell (Mayor of the city), who welcomed the Association in the following words:

Mr. Chairman and Gentlemen of the Western Gas Association:

Cincinnatians extend to you greeting and the hospitality and liberty of this city. Our citizens appreciate the compliment you pay them by coming here.

We sincerely trust your meeting will be so successful and your stay among us so enjoyable that you may find it to both your profit and pleasure to make annual pilgrimages to Cincinnati. We naturally judge those coming from other parts of our country by a comparison with those who follow a like calling or profession in our own community. Judging you in this manner, gentlemen, you are entitled to a specially warm welcome, for we have a no more progressive, a no more intelligent, a no more patriotic citizenship than those who follow your calling in our city, at the head of which stands that splendid soldier, that valued citizen, our beloved and respected friend and fellow-townsman, General Andrew Hickenlooper.

We have always had a great admiration for the intelligence and for the genius of those engaged in the manufacture of gas. They must necessarily be great geniuses to invent a system that compels all citizens alike to pay cash for their product. I know of no other business that "meters" out such equal justice to all.

You, gentlemen, wield a very great influence for good, and do more in the way of preventing crime than do the police. The evil doers of to-day, like it was said of those of old, seek darkness rather than light; and where we have a well lighted city, with brightly illuminated streets and alleys, you may rest assured that city is free from crime. You are, therefore, the preventers of evil, the promoters of good.

We know you will take advantage of your stay to visit and inspect the most perfect gas plant in the world, situated right here in Cincinnati.

We extend to you a most cordial invitation to inspect, besides, the best Fire and Police Departments in the United States; to visit our City Hall and our beautiful hilltops, which are unsurpassed anywhere for natural beauty and scenery.

We also extend to you the liberty of thinking what you please, saying what you please and doing what you please while you tarry amongst us. We wish you a most successful and enjoyable meeting, and hope you will not fail to come again.

Response by Mr. Copley.

At the invitation of the President, Mr. I. C. Copley thus replied to the Mayor's address of welcome:

Mr. Copley—Mr. President, in reply to the kindly welcome extended by Mayor Caldwell I feel the natural modesty of a gas man who is about to receipt a bill for some customer who claims the Company is his best friend. Such moments are so deliciously rare as almost to deprive one of the power of proper expression of gratitude. Your Honor, it gives me great pleasure to voice the thanks of the Western Gas Association for the privileges which you have so kindly proffered. As we have met in Cincinnati twice before, and as this is the third time, the city is not new to us, although perhaps we are new to you in your official capacity. Yet we hope to come again, and we trust we shall still meet you occupying your present exalted position. A lawyer who can only extend or will only extend his period of office some three months, when he might do so indefinitely and be supported by the supreme tribunal in his State, is a victim of such unselfish diffidence as to excite the pity and even the incredulity of ordinary men who earn their daily bread by the sweat of a little black ticker which never sleeps. We are more than willing to concede the truth in all you say regarding the advantages, the resources, the conveniences and the hospitality of Cincinnati. We have heard of your baseball team. Some of us have marvelled at your sunshine; a few of us have drunk of the limpid water once. Many of us brought small portions of the soil of contiguous States to your city. All of us who have had any use for water for any purpose whatever are likely to take a good deal of the soil of Ohio home with us. If Cincinnati cannot offer water that is inviting, however, she has provided a substitute, and, in the phraseology of our profession, your capacity for manufacture is ample, your distributing system perfect and drips are conveniently located. Mr. Mayor, we thank you for the freedom of your city. We also assure you that not more than one of the members of the Association will take you at your word to such an extent that he will violate your ordinances on street excavation. You have dealt with him before, and we leave him to your kindly care. Most of all, we thank your Honor for the kindly expression of goodwil you offer to us as gas men. We gas men are not so bad as we are often painted; and yet we may not be up to your high notions of standard. Your idea is necessarily molded more or less by a personal association and contact with the distinguished representative of our Association, who lives in Cincinnati. Let me tell you, sir, among gas men Gen. Hickenlooper's public policy, his management and business integrity are regarded as standard. The achievement of this standard will do more than anything else to solve the many vexed problems that occur when justice to the public seems to conflict with justice to vested rights. In conclusion let me say to you that we hold your proffer of the freedom of the city sacred as a mark of hospitality, and each one of us will take home pleasant recollections of Cincinnati and also of its honored Mayor.

On motion, it was agreed to dispense with the calling of the roll until just prior to adjournment.

On motion of Mr. Ramsdell, the reading of the minutes was dispensed with.

The President then read the following

Inaugural Address.

Gentlemen of the Western Gas Association: After our meeting in 1895 with our friends at Pittsburg, and our sojourn to grand, old historic Lookout Mountain, near Chattanooga, we are again assembled at our old home in the beautiful city of Cincinnati, to hold our 20th annual meeting. As there has been no great innovation in our business the past year, I must confine my remarks to a general review of the year just past, and a few recommendations for the future.

With the papers that are to be read at this meeting, and the known ability of the gentlemen who are to present them, I have no doubt this meeting will be interesting and instructive to us all.

We will have presented for your consideration, papers on the following subjects:

"Revivification of Oxide of Iron in Purifiers," by Mr. I. C. Baxter;" "The Failure of the Commercial Attempts to Supply Fuel Gas in the United States," by Mr. F. H. Shelton; "Selling Gas," by Mr. I. C. Copley; "Leakage," by Mr. E. H. Jenkins; "An Oil Tar Separator," by Mr. John R. Lynn; "Welsbach Lighting," by Mr. H. Wilkiemeyer, and the "Wrinkle Department," edited by Mr. Geo. Treadway Thompson.

I regret that the secretary was unable to secure an author for a paper on the subject of loss of light due to interior decorations, which subject was selected by the executive committee. I am sure it would have been interesting, as it is a matter that has had too little attention paid to it in the past, and if brought to the attention of the average consumer, would decrease the number of complaints of poor lighting quite materially.

The great depression in business which has prevailed throughout the entire country the past year, has had the effect of decreasing to a large extent, the magnitude of the gas business in most towns and cities; notwithstanding this fact, the gas business has not suffered to a degree commensurate with other lines of business. While many factories and mills have closed or largely reduced their working force, and many banks and business firms have been obliged to close their doors, it is very gratifying to record that, after a close investigation of the gas business, not a single company of any importance is on record as having passed into the hands of a receiver, while the books of some will show a decided increase of business over the previous year.

To maintain or increase our business through these trying times we have been taught many ways of economy, as well as the development of much energy in the introduction of ways and devices of maintaining our business, that in former years were not thought necessary.

To offset the inroads made upon our business through the introduction of electric light in most of our stores and public buildings,

together with the loss of our street lighting, we have been obliged to seek a class of consumers which had been neglected in the past. I refer to the small householder. Time was when gas was considered a luxury and enjoyed by only the wealthy, but at the present price of gas, it is within the reach of all, and the mechanic, the clerk, and many persons of small means are learning to appreciate its many advantages. I believe the best way to reach this class is by personal solicitation, and demonstrate to them that gas used with proper economy will give the cheapest and safest light, and as a fuel for cooking will accomplish the greatest results with the least trouble and expense.

The feature of heating dwellings by the introduction of a gas furnace, either hot air, hot water or steam circulating, that can be operated with some degree of economy, is worthy of much thought and study by our fraternity. The introduction of a device for this purpose even though it should cost one-third more than coal, as a fuel would be popular, and in the aggregate would effect a saving in the way of smoke, dirt and labor, and would be no small factor in increasing our output. The introduction of gas heaters and cook stoves has educated the public to the utility of gas for heating the whole house, its many advantages, its cleanliness and saving of labor strongly recommend it to the average householder, and its proper solution would be of inestimable value to the gas industry. I am aware that there are now a number of gas furnaces for this purpose on the market, and have no doubt they have many good points, and in some localities are practicable, but in most localities the consumption of gas required cannot compete with coal as fuel. I have been approached in the past year by a number of gentlemen on this subject, who are anxious to heat their houses with gas, and who would willingly give from $100 to $150 per year for heating their houses of from eight to ten rooms.

The wonderful strides made in Kansas City, Mo., the past year were most remarkable; the increase in the output of gas due to the low price and the liberal treatment by the companies of their patrons in the way of free services, free stoves and the systematic and thorough manner in which it was managed, was a revelation to the gas fraternity. It demonstrated what can be accomplished by the method pursued, and while I have no doubt it is exceedingly expensive and beyond the reach of most gas companies to pursue such liberal measures, it nevertheless tends to show that the lowest price that a company can afford to make with due consideration to its stockholders, is the correct principle.

A laudable effort has been made by some of our most enterprising members to secure from Congress proper tariff protection on gas residuals, at present with very uncertain results. This is a matter that concerns every gas man regardless of his political faith, and I would earnestly request each member of this body to communicate with the representative in Congress of his respective district, to use his influence in procuring a tariff on gas residuals that will shut out the cheap foreign articles. Quantities of pitch have been imported into this country, the transportation being nominal, it being taken as ballast. This has worked a great injustice to our business, and has been a potent factor in retarding the lowering of the selling price of gas by the gas managers, manifestly to the detriment of the general public. I have no doubt the duty can be restored by a united effort, and it is certainly worthy of such an effort.

Mr. Littleton in his address to you last year, referred to the legislation adverse to our business interests, and I deem it proper to again call your attention to it, and to urge upon you the necessity of taking some measure to protect our interests; the number of bills proposing to regulate our business which regularly come before our legislative bodies at each session, is ample proof that we should take some action in the matter, nor is this all. Each year we have to record the advent of an opposition gas company in one or more of our cities, and invariably the result is the same; that within a short time the two companies combine in one way or another, and while the public have enjoyed a low price for their gas during the opposition, they are soon compelled to make good all losses incurred in the fight by an advance in price, and with the double investment of the two plants on which they are bound to earn dividends, the public is deprived of a legitimate reduction in price, which would be made possible were they only paying interest on an investment for a single plant which was ample for all needs. I would recommend that this Association appoint a committee on legislation and that they be instructed to frame a bill creating a commission similar to the Massachusetts Commission, to be appointed by the governors of the several states or otherwise, that would give our industry the protection to which it is entitled.

A little over one year ago the gas fraternity was startled by the claims of the promoters of the calcium carbide or acetylene gas. It was heralded throughout the country that it was the light of the future, and would supersede all other means of artificial lighting; the ease in which it could be installed without the labor and expense of laying mains and services, and its beautiful and powerful light were indeed very attractive, and gave rise to much anxiety and uneasiness to many owners and managers of gas and electric light companies. Gas and electric light stocks declined and extensions and betterments were for a time abandoned, awaiting the further developments of this wonderful discovery. But time has not demonstrated the claims and assertions of the patentees and promoters of this much lauded light, and the then much discussed subject is rarely referred to now. I am told that carbide of calcium is being produced and is for sale at about $50 to $60 per ton, but its element of danger debars it from becoming a competitor of coal or water gas. It is another demonstration that all is not gold that glitters.

The selection of a place for our annual meeting is a subject of serious consideration. In the past the entertainment that has been accorded us, has been expensive and beyond reasonable expectation of the members of our association, and the assessments made on our business friends for arranging for our entertainment, I have no doubt has been burdensome to them in many instances.

In selecting a place of meeting we should do so without causing our friends to feel that in coming to their city, we are to be a burden upon them, and I am sure that if a majority of our members wish an elaborate banquet, or other expensive entertainment, they can arrange for the expense of same among themselves.

The Gas Exposition.—Without doubt there has never been held in this country an exhibition of gas appliances for the manufacture and use of gas, equal to the gas exhibit held at Madison Square Garden, New York City, which opened January 25th, and continued for two weeks. It was evident to the thousands who visited it that the gas engineers had not been idle, that many new and improved methods had been adopted for the manufacture of gas and the saving of residuals, as well as the many appliances and devices for the use of gas, many of which were shown in actual use, giving ocular proof of their many good qualities. Many people who had come to believe that gas for a light was a back number or a thing of the past, were forcibly impressed with the idea that the electric light still had a powerful rival in the incandescent gas lamp. The thousands in use brilliantly lighted the entire building, and the many beautiful clusters and designs were effective in demonstrating the possibilities of the great Welsbach light. It was an exhibition that was of inestimable value to the gas business, and to our friends who manufacture gas apparatus and supplies, it will no doubt bear fruit for many years to come. Too much credit cannot be given to the gentlemen who inaugurated and carried it to so successful a close; they should have the sincere thanks of the entire gas fraternity.

Our Departed Brothers—We have to record the death of two of our most esteemed and honored members, men who fought their way to the front under many trying situations, having entered the business when gas-making was exceedingly crude compared with the present time.

Richard Spencer, died October 16th, 1896. He had been connected with the Burlington (Iowa) Gas Company for over 38 years, having entered their employment as superintendent. He joined this association at its third annual meeting and for many years was a regular attendant, but for the past few years, his health having become impaired, he had not been able to attend. He was honored and respected by the community in which he lived, and by the entire gas fraternity who knew him.

Joseph R. Thomas, died November 28th, 1896. He was one of the most widely known men in our profession, having been connected with the gas business in various positions for many years. He was ever ready to give advice and counsel to the younger members, and many have profited by his experience. Kind and genial he was loved and respected by all. He has passed away, but his example still lives.

In conclusion I wish to thank the gentlemen who have prepared papers for this meeting, and you all, for the honor of having been called to preside at this meeting, I thoroughly appreciate it and thank you heartily.

COMMITTEE ON PRESIDENT'S ADDRESS.

Mr. J. T. Lynn (who occupied the chair while President Odiorne read his address), on motion that the address be referred to the customary committee for consideration and report, appointed as such committee, Messrs. William McDonald, B. E. Chollar, J. B. Howard, James Somerville and J. W. Murdock.

APPOINTMENT OF SPECIAL COMMITTEES.

The President announced the appointment of the following special committees:

Introduction of Visitors.—A. S. Miller, A. B. Slater, H. W. Douglas.

On Memorials.—C. R. Faben, Jr., W. M. Eaton, W. H. Morgans.

On Place for Holding Next Meeting.—F. H. Shelton, K. M. Mitchell, Geo. G. Ramsdell, Fred. R. Persons, C. H. Evans.

On Final Resolutions.—E. G. Cowdery, C. W. Blodget, W. B. Sellers.

Secretary Dunbar read the following

REPORT OF THE BOARD OF DIRECTORS, AND REPORT OF SECRETARY-TREASURER.

The annual meeting of the Board of Directors of the Western Gas Association was held at 10 A. M., Tuesday, May 18th, at Grand Hotel, Cincinnati, and was called to order by the President, Mr. W. H. Odiorne. The following members of the Board were present:

A. W. Littleton, Quincy, Ills.; Wm. Steinwedell, Quincy, Ills.; O. O. Thwing, St. Louis, Mo.; I. C. Copley, Aurora, Ills.; C. W. Blodget, Brooklyn, N. Y.; H. W. Douglas, Ann Arbor, Mich.; James Forbes, Chattanooga, Tenn.

On motion of Mr. Littleton the following papers were accepted for presentation to the Association:

"Revivification of Oxide of Iron in Purifiers," by Mr. Isaac C. Baxter; "Selling Gas," by Mr. I. C. Copley; "Leakage," by Mr. E. H. Jenkins; "The Welsbach Incandescent Gas Light for Utility and Economy in Street Lighting," by Mr. H. Wilkiemeyer; "An Oil-Tar Separator and Its Results," by Mr. John R. Lynn; "A Study of Inclined Retorts in Europe," by Mr. Frederick Egner; "The Failure of the Commercial Attempts to Supply Fuel Gas in the United States," by Mr. F. H. Shelton; "Wrinkle Department," edited by Mr. George Treadway Thompson.

The Secretary-Treasurer read the following report:

Receipts.

To Membership fees	$220.00	
" Annual dues	1,010.00	
" Sale of badges	52.50	
" Balance, cash on hand, May 1st, 1896	177.28	
		$1,459.78

Disbursements.

By Secretary's salary	$400.00	
" Sundry bills, as per vouchers	586.66	
" Balance, cash on hand, May 1st, 1897	473.12	
		$1,459.78

Membership, May 1st, 1896	270	
New members admitted 19th annual meeting	22	
		292
Dropped for non-payment of dues	17	
Resigned	4	
Deceased	2	
		23
Membership, May 1st, 1897		269
Badges on hand, May 1st, 1896	31	
Sold	15	
Badges on hand May 1st, 1897	16	

The President appointed the following Committees:

Auditing Committee—A. W. Littleton, H. W. Douglas, O. O. Thwing.

On Applications for Membership—I. C. Copley, C. W. Blodget, James Forbes, George Treadway Thompson, William Steinwedell.

On motion of Mr. Littleton, the President was instructed to appoint a committee to investigate the approximate cost of publishing, in book form, the proceedings of the Association from its organization to the present time.

The President appointed the following to compose the committee:

On Cost of Proceedings—A. W. Littleton, O. O. Thwing, James W. Dunbar.

On motion of Mr. Littleton, it was carried that the following be selected as the time for convening the meeting of the Association:

Wednesday, 9.30 A. M., 2 P. M. and 8 P. M.; the evening session to be for the election of officers only. Thursday, 9.30 A. M.; Friday, 9.30 A. M.

There being no other business, the Board adjourned.

JAS. W. DUNBAR, Sec'y.

On motion the report was adopted.

ELECTION OF NEW MEMBERS.

Mr. Copley, Chairman of Committee on Applications for Membership, reported that the applications of the following named gentlemen for membership in the Association had been approved:

Active.

Andrews, C. W., Hamilton, O.	Ellison, B. F., St. Paul, Minn.
Freese, S. C., Albion, Mich.	Little, F. W., Akron, O.
Leadley, Jas. E., Sidney, O.	Lathrop, A. P., Columbus, O
McDonald, D., Louisville, Ky.	Owen, C. J., St. Louis, Mo.
Slater, H. C., Milwaukee, Wis.	Sweetman, M. M., Kansas City, Mo.
Summers, T. W., Hornellsville, N. Y.	Welch, C. H. Athens, O.

Associate.

Carpenter, H. A., Sewickley, Pa.	Corbus, F. G., Chicago.
Dwyer, F. T., Detroit, Mich.	Hunt, W. P. Jr., Chicago.
Prendergast, D. J., Phila., Pa.	Stephens, J, G., Pittsburg, Pa.

On motion of Mr. Dunbar the report was accepted, and Mr. Copley was instructed to cast the vote of the Association for the election of the persons named in the report of the committee.

Mr. A. S. Miller, from the Committee on Introduction of Visitors, reported that a large number of visitors had come to the convention. On behalf of the Association they had been heartily welcomed and had been invited to join fully and freely in the proceedings and discussions.

The President then introduced Mr. I. C. Baxter, of Detroit, Mich., who read the following paper on

REVIVIFICATION OF OXIDE OF IRON IN PURIFIERS.

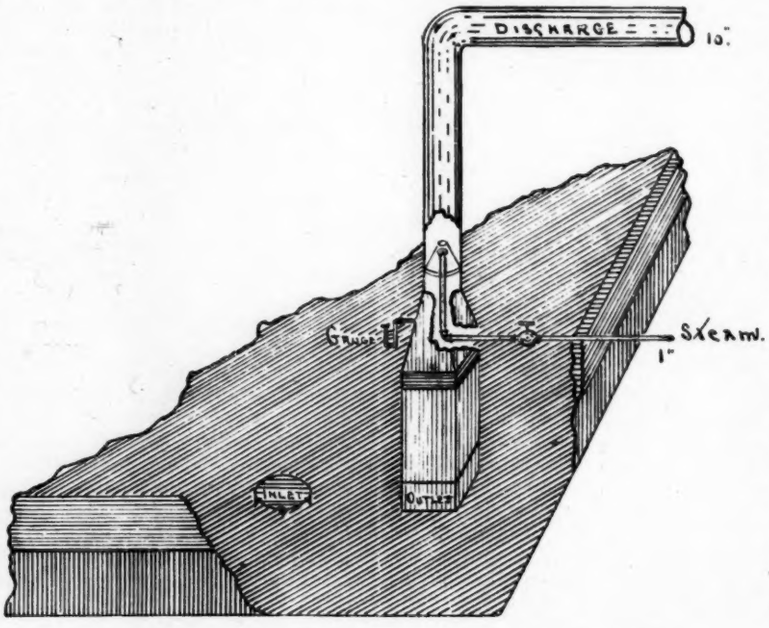
The almost universal use of oxide of iron for the removal of sulphureted hydrogen from illuminating gas gives to the subject of revivification an interest to all energetic members of the gas associations. The advent of the use of this material followed by its undisputed success under exceedingly great disadvantages has passed, and there is not an advanced engineer in the land to-day who can question in any way its economy and adaptability for the purpose intended. The old objections to its deteriorating effect upon the quality of gas, its corrosion of meters and its general unreliability have disappeared with the disclosures of scientific investigation, the complete removal of ammoniacal compounds and the construction of purifiers of proper dimensions. The history of this material from the time of its first application as a purifying agent has been clearly outlined by the numerous papers and discussions of the past decade, and has become too generally known for any lengthy narrative at the present time. When, however, we consider the objections which have been raised to every marked advancement in trade or science, it is not a matter of wonder that the introduction of what is now considered the prevailing method of purification was forced to meet the misguided statements, which only served to bring out in bolder relief truths that could in no wise be confounded.

To whom the honor of first introducing oxide of iron to the American gas industry belongs, is a matter regarding which there might be very reasonable doubt. At about the same time back in the sixties several well-known gas managers commenced experimenting with a material known as "grindstone grit," which resulted from the grinding of castings and being exposed afterwards to the weather, took on a reddish brown color. These experiments led to its substitution for lime in several plants, but in the majority of cases enough of it could not be obtained for the total requirements. In its primitive state it was rather heavy and inclined to cake, and as it was found to work more satisfactory with an admixture of sawdust and lime, the incompetency of the supply finally led to the preparation of iron sponge. There was an abundance of iron borings and the oxide eventually proved even more satisfactory than the "grindstone grit" had been. In some plants the latter is still used, but the factories have begun to realize that it has a value to the gas company and are now deriving some revenue from its sale.

The proportions of iron borings and sawdust as used at our works is, I think, the general ratio employed; that is, equal quantities by weight. We have also used the natural oxide obtained in the vicinity of Ann Arbor, as at the time the old Detroit companies were consolidated the Mutual Gas Company had for several years been employing it altogether. While the results from the latter were satisfactory, for several reasons the prepared oxide was preferable, as there appeared to be some ingredient in the natural oxide of a combustible nature, and upon several occasions fire was narrowly averted.

The greatest advantage in the use of oxide of iron has been the economy resulting from its free revivification when exposed to the action of the oxygen of the air in the presence of slight moisture. For years this has been accomplished by spreading the material and turning it over from time to time, but the greatest rapidity of the action and the most economical results are to be obtained by mechanical methods. With the displacement of lime in the purifying department a reduction of at least 80 per cent. in the cost of purifying 1,000 cubic feet was effected, and by mechanical revivification a further reduction of 50 per cent. can easily be obtained. It must be admitted that there may be dangers attending such methods, but where proper care is exercised these may be easily mitigated and in fact wholly obliterated. That careful manipulation is a necessity to the safe conduct of the purifying department always, experience has long established.

The iron oxide in use, with the exception of 900 bushels, we have prepared from time to time, and it has an average age of about 3 years. The exception referred to was obtained from an eastern chemical company 700 miles distant, who offered it in exchange for 9,000 bushels of spent oxide, they paying the transportation charges to and fro upon all the materials, and utilizing the sulphur contained in the spent oxide in the manufacture of sulphuric acid. From the fact that such contracts have become quite common, it is to be understood that the working of the spent mass is profitable, and may become in time a source of income to the gas companies themselves.



SECTIONAL VIEW OF PURIFIER, SHOWING STEAM JET CONNECTION.
Scale, ¼ Inch to 1 Foot.

Four different methods of revivification in the purifiers have been employed at the Detroit gas works. During the second year of my connection with the plant, we drew through a 2-inch pipe from above the roof to the exhauster inlet, with a 100-light meter between, 15 cubic feet of air to each 1,000 cubic feet of gas produced. We were able by this means to purify a greater amount of gas per bushel of material, but the effect upon the illuminating power of the gas was so marked that during the winter months the plan was abandoned. By this method an increased amount of oil was required per 1,000 feet of water gas produced to maintain a standard candle power, and from that fact alone its use can not be recommended.

During the summer of 1891 we mechanically revivified the oxide of iron in our carbureted water gas purifiers during the night. As we were then using our Lowe apparatus only during the day, we connected the inlet of the exhauster with a 4-inch pipe from the outer air, and after setting the Morava valve forced air through the inlet of either purifier as required. After passing up through the oxide, the impurities were discharged through the hand-hole or air vent on the cover into a 4-inch pipe, which emitted them outside the building. We were enabled to obtain fair results from this method, but the cover of the purifier became heated to such dangerous temperatures that it was discontinued after a few months.

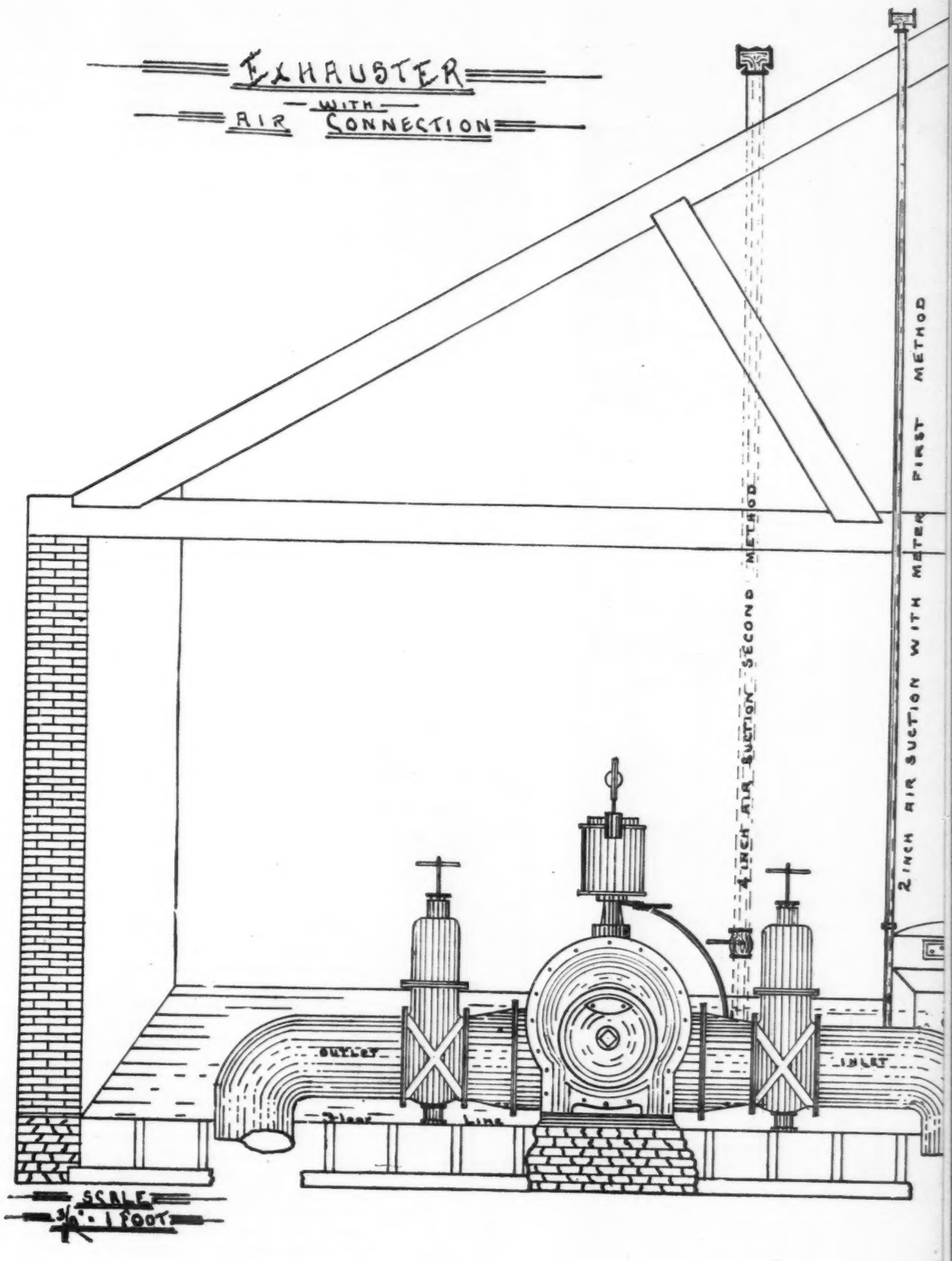
In the fall of 1892 we began the use of the steam jet apparatus. Fitting over the outlet opening above the oxide level in the foul purifier was placed a galvanized iron pipe, tapering from the connection to 10 inches in diameter, and from this latter to a 3-inch opening. A 1-inch steam pipe with a valve led into the side of the 10-inch section, passing along in the center until it reached a point a few inches from the 3-inch outlet. The steam pipe was partially closed at the end by a cap having twelve $\frac{1}{8}$ inch perforations, thus reducing the main opening three-fourths and securing an excellent spray jet. With this in operation we maintained a water vacuum of 1 inch, drawing the air down through the oxide, the inlet purifier connection, the idle sections of the center seal and outlet, and discharging outside the building through a 10-inch galvanized iron pipe with a collar connection over the 10-inch section adjoining the outlet of the purifier. The center-seal, connections and the bottom plates of the purifiers became heated to such an extent by this operation that the cracking of castings was feared; and, after using the jet for about one year with considerable worry and trouble, we cast it aside and returned to the ordinary revivifying methods in the outer air.

Our fourth plan has been in operation since September 1, 1896, and has been very satisfactory, our experience being such as to warrant the statement that it will be continued until something more advantageous is presented, which does not seem likely in the near future.

During the winter of 1895 and 1896 the purifying capacity of the Detroit gas works was put to such a test that it was found advisable to put in during last summer four new purifiers 30 feet in length, 20 feet in width and 4 feet 6 inches in depth. Previous to their completion we had been passing our coal gas through a set of four boxes 20 feet in length, 18 feet in width and 3 feet in depth, with a center seal, while our carbureted water gas was passing a set of two boxes, 20 by 20 by 6 feet with the Morava valve system. In the latter we had been compelled at times, when the consumption of gas was at its maximum, to use a layer of lime in the upper tray, and it was the use of this material we desired most to avoid, next of course to the fact that we desired to supply a quality of gas which could cause no just complaint from our consumers. In these deep purifiers we used three sets of trays and above each of these we had a test cock connection. During the past winter the four new boxes have been used for purifying our water gas, while the two deep boxes have been reserved for contingencies which might arise, being connected so that either coal or water gas can be turned into them at any time. When the last set of purifiers was erected, openings for extra 8-inch connections were left in one bottom plate of each for revivification purposes, and as the other boxes were idle, from time to time, openings were made in them with the same intention.

A blower was purchased from the Detroit Blower Company, alterations were made for the purpose intended, and connections made so air could be drawn through any one of the ten purifiers as required. Instead of employing valves for the purpose of shutting off the boxes when not undergoing revivification, water seals have been used between each purifier and the main connection with the blower. With valves a sediment invariably collects in the seats and prevents closing the gates down tightly. After the gas is turned into a purifier and revivification of the foul oxide of another is commenced, a leak of gas in sufficient quantities to be very dangerous is quite liable. The heated impure gases about the blower might cause an expensive explosion, the damage resulting

EXHAUSTER WITH AIR CONNECTION



EXHAUSTER
— WITH —
AIR CONNECTION

2 INCH AIR SUCTION WITH METER FIRST METHOD

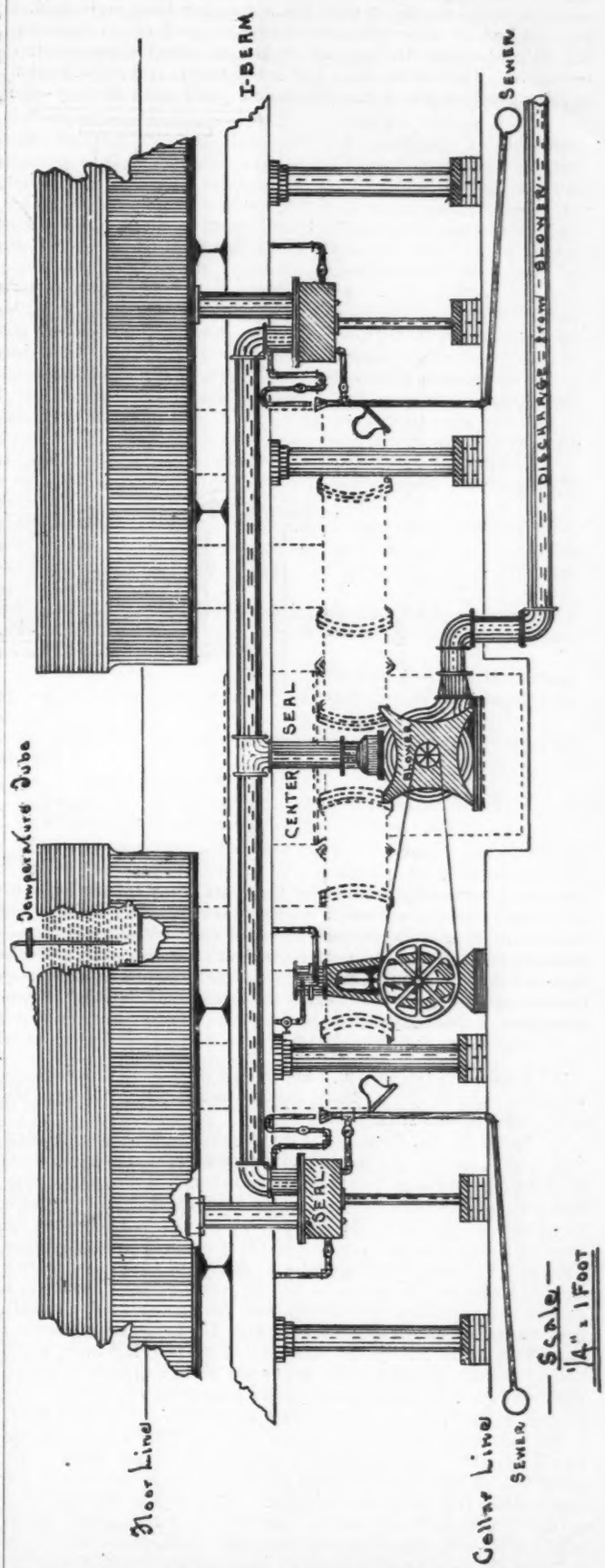
being such as to greatly inconvenience the plant for some time to come, as such an occurrence would be most apt to assert itself at a time when the consumption of gas was at a maximum and the purifying department doing its greatest work. With a water seal of the pattern I shall describe, better satisfaction is to be derived, as the slightest leak in the seal is easily detected and there is no possibility of the gas passing beyond the inlet of the seal and accumulating about the blower. It would be difficult to imagine a scheme more perfect and at the same time more simple, and the description which follows I have attempted to make as clearly comprehensible as possible.

An 8-inch perpendicular pipe drops from the bottom plate of each purifier through, and 8 inches below the cover of the seal box which is constructed of cast iron, ¾ of an inch in thickness, the dimensions being 27 inches in length, 12 inches in width and 12 inches in depth. The distance between the inlet and outlet center is 1 foot, and the outlet merely screws into the cover of the seal. One foot above the cover a 1-inch wrought iron overflow screws into the outlet, extends horizontally 6 inches, bends downward 2 feet, and after running a few inches in a horizontal direction turns upward 2 feet 2 inches, and by a downward return overflows into a funnel connected by a 2-inch wrought iron pipe, with a sewer. The siphon described has a cock which can be shut off when the water has been run into the seal, or at any other time as required. The water inlet is a 1½-inch pipe entering the box at the bottom of the end next the 8 inch outlet, and can be shut off or turned on without the workmen leaving the seal. From the bottom of the seal the water can be drawn off when revivification is commenced by opening a 2-inch cock on a line which screws into the bottom shell, and communicates with the 2-inch wrought iron pipe receiving the overflow. It can be readily seen by the drawing and description that this affords sufficient seal for all practical purposes and I am satisfied it is less dangerous than a valve system.

Inserted in perforated bronze tubes placed in different portions of the purifiers in which the oxide is being revivified, we have placed thermometers and kept a close record of the temperatures at the various points. The temperature has always reached the greatest point near the inlet and outlet of the purifier, but very seldom has it risen above 120°. The water vacuum drawn averages 7-10 of an inch. We have also kept a record at the outlet connection of the blower, the thermometer there never registering more than 118°. We have generally drawn air through the purifiers until the temperature in the tubes was lowered to that of the air in the room, but on some occasions have been compelled to turn the gas through oxide having a temperature of 85°. There have never been any indications of heat at a dangerous state, but when high temperatures are attained, the material is subjected to a slight spray of water.

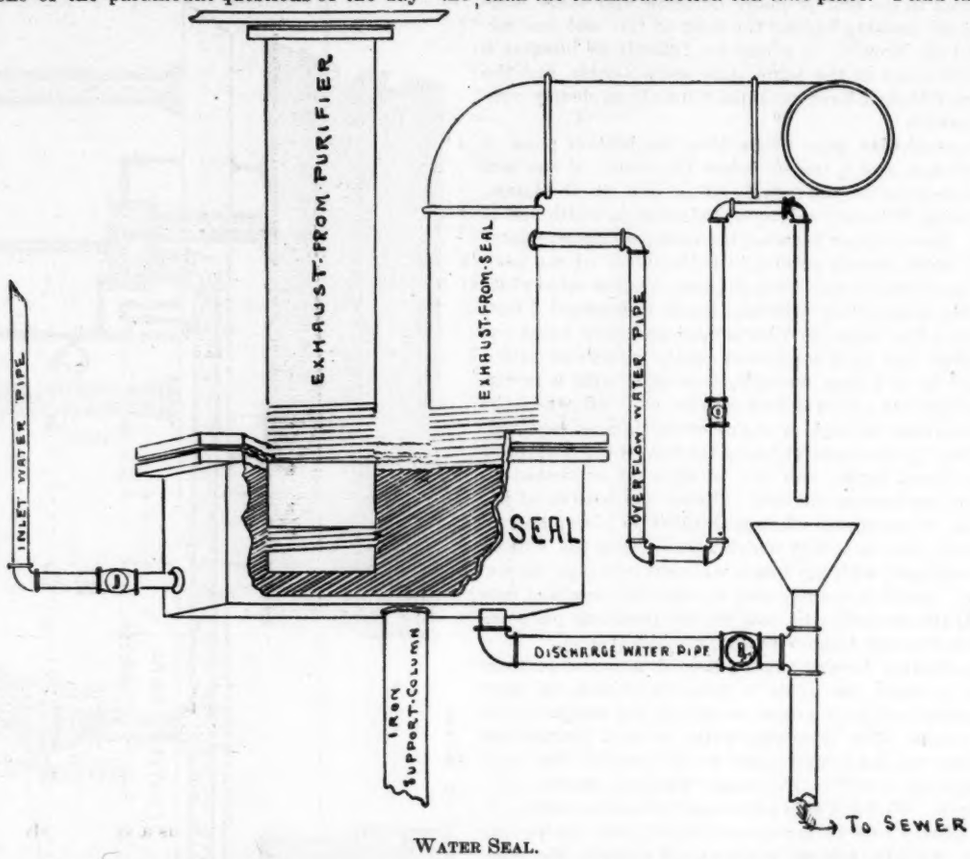
The statements of results which follow are as nearly accurate as it is possible to obtain them. During the six months ending March 31st, 1897, the total saving effected in labor in the purifying department has amounted to $300.00, or $50.00 per month, the comparison being made over the corresponding six months of the previous year when the total production of gas was about the same amount. Water gas purifiers were changed 4⁰ times, the material having been all removed once and turned in the purifiers twice. This leaves a total of 36 changes during which the oxide remained untouched. These purifiers each contain 1,072 bushels, while those used for the coal gas contain 482 bushels. During the same six months the latter were changed 22 times, the material having been turned in the purifiers once, but never at any time removed. On account of the packing of the oxide after a time and the consequent resistance of the gas exhausters, it will be found necessary at times to turn the material. The amount of gas made during the period mentioned was 210,000,000 cubic feet, of which 149,000,000 were carbureted water gas and the remainder coal gas. The time required for the revivification of the oxide during that time has been days and twelve hours, considerably less than one-half of the time, and in the majority of cases changes were necessitated by increased back pressure, resulting from the dry caking of the oxide.

An effort has been made to plainly state the facts in our experience, and in order that they may be more clearly understood the accompanying drawings of the various plans have been produced. Realizing the vast importance of this subject to the gas industry and the labor required to give it just treatment, my consent to write this paper was very reluctantly given; and while there is no apol-



SIDE ELEVATION OF BLOWER AND CONNECTIONS USED FOR REVIVIFYING OXIDE OF IRON IN PURIFIERS.

ogy to offer for the manner in which the duty involved by my acceding to the wishes of your committee has been performed, I feel that had not other affairs demanded so much of my time during its preparation, the subject could have received much better treatment. There is no doubt that to us, mechanical revivification of oxide involves one of the paramount questions of the day—the question of economy. Throughout the years of my connection with the class of men about me, there has never been a time when the importance of what were once regarded as small matters was so strongly felt. By mechanical revivification an economy of both time and labor is assured, and the proper methods of accomplishing the best results is certainly worthy of the calm and intelligent consideration of this body.



WATER SEAL.

Discussion.

The President—Gentlemen, I hope you will discuss this very interesting paper in the manner that it merits. Mr. McElroy, we will be glad to hear from you.

Mr. McElroy—Mr. President, I thank you for the honor of being called upon, not being a member of your association, as every drop of experience adds to the rivers of knowledge. I may say I have had considerable experience as to the revivification of iron oxide by mechanical means in the last two years, and prior to that by blowing steam through it, which is often dangerous work. Since I put in Sturtevant blowers we get a vacuum of from 8 inches to 1 inch of water, which seems to do the work without trouble. I started two years ago with one blower, but my oxide during this past winter became so foul (I had no time to change it, or to secure new), that I was put to the extreme of revivifying every eight hours, which occupied all the time—too close a margin in works the size of ours. We are so restricted in capacity that I put in another blower, so that now I can run either one or both at the same time. I feel confident, as the saying is, that we "have it where the hair is short." I can handle the plant easily at all times. The great trouble has been in the majority of cases to put iron in the boxes before it is properly oxidized. I find if you introduce iron in the box it will not oxidize and become a mechanical oxide, which is the only thing that will take effect in the boxes, but if you will take the precaution to prepare your material before you introduce it into the boxes and bring it into positive oxide you will have no trouble thereafter. The main thing is to watch your temperature. When the material is new and at the third or fourth time it is revivified you are very apt to run your temperature to the dangerous point of fire. For that reason I run my exhauster sometimes to eight inches, taking the volume of air through the boxes in sufficient quantity to cool it down, as I suppose quicker than the chemical action can take place. I find the more air I put in the more heat I make. I reduce my vacuum from one-half inch to one inch. That is my general practice now, unless the box is very badly caked, then I have to increase the vacuum so as to draw that air down through, and we only change our boxes when they give back pressure, which is once in four times. I turn it out at the end of three months, letting it remain for about three weeks in piles, to revivify in its natural heat, and then replace it in the boxes, keeping two extra boxes for that purpose. My connections are made by valves. Mr. Baxter mentions the trouble of using valves. My connections are 10-inch, independent of the center-seal. My experience taught me to see that by keeping the center-seal expanding and contracting, as it does, by passing the heated atmosphere through it, was very deleterious to the center-seal and will in time cause it to leak. That is my claim. We have a 10-inch pipe, and a gate valve, quick-opening, and find, as Mr. Baxter says was his experience, they are very apt to foul and give some little trouble. I recommend to those who desire to introduce a system that they put in a water-seal instead of a valve, making it of sufficient depth to equal the back pressure upon any of their purifying boxes when in action and adding thereto the vacuum you may be drawing on the purifying boxes. For instance, say you had a 24-inch seal on your purifying box, I would add 8 inches for my draft, making a 30-inch seal—no less for safety. If I had to put in any new boxes I should use the water-seal instead of the gate valves.

Mr. Thompson—Mr. McElroy, what was the size of the boxes and the quantity of gas you endeavored to pass through each set? That would be an indication to us of the limit to which we can go.

Mr. McElroy—Our boxes are 20x24; the depth of the purifying material 22 inches; and our make at that time was 2½ million per diem with eight boxes, six in action; then I had to revivify every 8 hours.

Mr. A. S. Miller—Mr. Chairman, I would like to ask Mr. Baxter a few questions and also to make one or two remarks in connection

with the paper. What is the objcct of drawing the air down through the purifying box instead of forcing it up; also, at what speed is the air drawn through? I have made a few figures in connection with this paper and I notice between changes Mr. Baxter purifies 6,000 feet of coal gas and 2,900 feet of water gas per bushel of oxide. I made some connections to revivify the oxide in position, but had to discontinue its use temporarily because I could not get the tar out of the gas before it went into the boxes. I am now making arrangements to scrub tar out of the gas, and propose to revivify the oxide in position. Meanwhile, however, I empty every box, clean it out absolutely and sweep the bottom of the box itself. During the last winter I have purified per square foot of surface of the box, 313,000 cubic feet. I notice Mr. Baxter purifies 170,000 cubic feet of coal gas and 248,000 cubic feet of water gas, in which case his boxes are doing less work than mine. He claims to save $50 a month over the previous year. That $50 a month would be .143 of a cent; our total purification labor—and we empty every box—was only .05 of a cent. as against his saving of .143. We also purify about 32,600 feet per bushel of oxide between changes; in other words, we made only 6 changes in 6 months. We have no special machinery for handling the oxide. The boxes are emptied through the bottom. Our apparatus for raising the oxide into the box is very slow and, to a certain extent, cumbersome. I think the fact that Mr. Baxter has new boxes, which increased his purifying capacity in an enormous degree, accounts to a certain extent for a great reduction in expenses. It is a well-known fact that the expense of purification varies very largely with the area of the boxes, and unless his expense is very much less than one-half what it was before, I think there is still a great deal of chance for a reduction, even if he throws the oxide out instead of revivifying it in position.

Mr. Thompson—Mr. Miller has explained his criticism of Mr. Baxter's paper, also the result between changes, by calling attention to the fact of the area. We know there is nothing else that will aid us so much as having very large area in the boxes. It was with that in mind that I asked Mr. McElroy the proportion between the sizes of his boxes and the quantity of gas. Mr. Miller's boxes are very much larger proportionately than those of Mr. Baxter, and will enable very much better results being attained. I was also going to state that the gases should not be carried from the purifiers during revivification in the off box, through the center seals. Mr. Miller can give us some experience in the matter of leaky center seals, due to their heating up during revivification. I would add one other point—by the attachment of a blower in the method Mr. Baxter has described we may remove the handhole at the top of the purifier cover and draw the gas from the purifiers, discharging it out of doors before we raise our cover, if we so desire, to avoid any danger to the workmen in the opening of the box at the time it is desired to remove the oxide.

Mr. A. S. Miller—I mentioned the size of the boxes. I said we purified in six months 313,000 cubic feet per square foot of surface. Mr. Baxter purified 160,000 cubic feet of coal gas and 248,000 cubic feet of water gas, so that we purify about 30 per cent. more of water gas and very much more than that of coal gas, per square foot.

Mr. Thompson—What was the relative speed?

Mr. A. S. Miller—We purified 30 per cent. more per square foot.

Mr. J. R. Lynn—Being at quite a distance from the speaker I could not catch everything Mr. Miller said. I would like to ask a question. Did he not understand Mr. Baxter to say that there had been quite a number of changes, which had been caused by the packing of the oxide instead of by foul material?

Mr. Baxter—The reason we made the changes in the purifiers was not owing to foul gas, but owing to the oxide caking and causing back pressure. We had better results in the summer than in the winter months, because we did not manufacture as large an amount of gas then as we do in the winter months. You know that in the summer you can always purify more to the bushel. As for making the connection at the bottom, at the time we were erecting the purifiers the opening was there, and I made the connection at the bottom 8-inch pipe instead of 10-inch. Mr. McElroy said he would make a 10-inch opening. I would advise a 12-inch instead of a 10-inch.

Mr. Jenkins—I would like to ask if there is any advantage in drawing the air down through the mass of oxide, or is it better to force it up.

Mr. Baxter—That has been my experience, drawing it down through. As Mr. Thompson remarked, you can take the handholes off at the top of the box.

Mr. Jenkins—That is to get rid of the gas.

Mr. Baxter—Also to draw through.

Mr. Jenkins—The point was whether there was any object in drawing the air down or forcing it up from the bottom.

Mr. McElroy—My experience in my first attempt in revivification was to blow the steam and air through the bottom of the box and passing the air up, out into the room, suffocating everybody in the house. The increase of the heat from steam heated the oxide, so we had to abandon its use. Now I remove the box lid and draw the air down through the whole surface of the box—a 15-inch pipe leads up from the house into the open air—and I have no trouble.

Mr. W. N. Miller—Did Mr. Baxter consider the cost of steam during the time of its passage and the drawing of gas through the purifiers? I would like to ask why he abandoned the use of the two large purifiers instead of using those of smaller dimensions?

Mr. Baxter—We have not abandoned the use of the two large ones. We intend to use them this coming winter. As for the cost of steam we have not taken that into consideration at all. We have a great deal of breeze around the works and we utilize that.

Mr. W. N. Miller.—Would it not be better to use your large purifiers in your works?

Mr. Baxter—It would be if so connected to do it. We have not our valves and connections made, and we just completed the other four boxes last fall or winter. We intend to do so this summer.

Mr. Buck—I would like to ask Mr. Baxter if he would consider it advisable or possible to use oxide in four boxes 6ft. x 6ft. x 3ft., on an annual output of 16,000,000?

Mr. Baxter—No, I do not think it would be advisable to use that system on boxes of that kind. You could utilize the retort house labor.

Mr. Buck—Would it be possible to try oxide in boxes of that size at all?

Mr. Baxter—I think it would.

Mr. Buck—Best to use oxide in boxes of that size?

Mr. Baxter—They are doing so at the Windsor gas works.

Mr. Egner—Mr. Baxter has given us a very timely and instructive paper, but I question some of his deductions. He speaks of "the old objections to its deteriorating effect upon the quality of gas." Now, that is a serious objection, because it is a fact that the oxide does not remove the carbonic acid. In my experience I have found that by using lime in making water gas for instance, we can make the same quality of gas and with a half gallon of oil less per 1,000 at least. The saving by oxide purification is not overstated, not in total; but I think the saving over lime is not 80 per cent. in the first place, and think the figures as given by Mr. Baxter should be reversed, that is to say, the 50 should be where the 80 is, and the 80 where the 50 is. I would also call attention to the statement which would lead us to suppose that the chemical factories buy the oxide for recovering the sulphur only. I think more likely they buy it for the purpose of getting the cyanides out of it. These are quite valuable, and a greater demand for them has been created, for instance in South Africa, where they are used to aid in extracting the gold from the refuse of tailings of the gold mines. I understand that from 18 to 20 cents per ton of coal carbonized has been realized from that newly worked residual product of gas manufacture. The paper is undoubtedly a most instructive one, and I wish to pass my compliments to Mr. Baxter for it.

Mr. A. E. Forstall—Mr. Baxter speaks of having tried constant revivification, or rather continuous revivification, by means of drawing in air with the gas, and finding that it depreciated the illuminating power it had to be abandoned. That has not been my experience. For several years we have drawn in 1½ to 2 per cent. of air, passed it through the purifiers, and were unable, by very close watching, to find that it made any great difference. I have not my notes with me, but as I remember the figures, I think over a period of four months we found that all we could account for was a difference of one-tenth of a gallon of oil per 1000 cubic feet extra, when we used the air over what we used when we were purifying without air. As far as the purification was concerned the change was very large. Where we only purified 10,000 feet to the

bushel of oxide without the air we could average, in our worst time of winter, from 25,000 to 30,000 feet per bushel of oxide, per change of box, with the air. In summer, on two occasions, we ran once as high as 89,000 feet per bushel, and the next summer 96,000 feet per bushel, per change. Our boxes are 24ft. x 29ft. inside measurement, and contain 1,000 bushels of oxide, and this past winter we averaged a trifle over 30,000 feet per bushel. We were passing gas through at the average of 1,700,000 cubic feet a day. We figured that our saving was about four or five times the cost of the extra one-tenth of a gallon of oil.

Mr. Egner—My experience is somewhat similar to that of Mr. Forstall. And since my friend Somerville is too modest to get up let me say for him that he remarked just now that there was perhaps a great difference in the percentage of iron in the oxide used by Mr. Miller and Mr. Baxter, which, of course, would account for the difference in their respective results.

Mr. Baxter—The oxide I have in use now has been in use for about 3½ years altogether.

The President—What is the formula for making it up?

Mr. Baxter—About equal proportions.

Mr. Forstall—I think I ought to say that possibly some of the improvement in our results of purification was due not only to the use of air but also to our heating the gas before entering the purifiers. Both were begun at approximately the same time.

Mr. Thompson—I would like to ask Mr. Forstall if he still continues to use the system of heating he described at the last meeting of the American Gas Light Association—the use of dry heat as he termed it?

Mr. Forstall—That method has been in use all winter. As I left the Newark Company on the first of March, I have not yet had a chance to get the figures; but I would say that the first box into which we put the large coil passed 50,000,000 feet of gas, that is, 50,000 to the bushel, and at that time we were making gas at the rate of about 1,500,000 feet a day, through boxes 24ft. x 29ft.

On motion of Mr. Somerville, a vote of thanks was tendered to Mr. Baxter.

The President then introduced Mr. I. C. Copley, of Aurora, Ill., who read the following paper on

SELLING GAS.

Within the last few years, all gas managers have come to realize very fully the advantage to be derived in pushing the sale of their wares, and there has been perhaps no meeting of men interested in the manufacture of gas for some years past, in which this subject has not been discussed in some form or other, usually with reference to some more definite detail than that assigned me by the Board of Directors of this Association. The subject is of a nature so general that I suppose I am expected to deal with it in a somewhat general way.

The same commercial laws which govern the successful selling of any other commodity must be applied by the manufacturer of gas if he expects to attain any unusual degree of success. All commercial laws, however, are modified more or less by the character of the men involved in and the conditions surrounding their application. For instance; a line of policy followed by the manager of a gas company in a town of some 6 or 8 thousand people must necessarily be very much modified in the application by the manager of a gas company in a city of 100,000 inhabitants. A gas man in a small town naturally knows each one of his customers by face and name. He knows the personal relations and personal habits of each. The gas man in a large city, as a matter of necessity, knows very few of his consumers, and must, therefore, adopt very different methods in calling the attention of possible customers to the desirability of using gas. The one can advertise in person; in daily conversation with his fellow townsmen; the other must rely entirely upon agents outside of himself. But the same general principle of bringing to the attention of the consumer the fact that he might possibly secure some advantage, either in the form of a financial saving or personal convenience, or both, is exactly the same, whether it be told to him by the manager of the small gas company or whether it be told through the columns of the great daily papers published in the larger city. My own experience has been confined to a few small cities, ranging from 16,000 to 35,000 people, and most of the observations which I have made have been taken in cities of similar size.

The man who would successfully sell anything (and this applies to our business with perhaps greater force than any other) must be thoroughly saturated with the idea that he has an article of merit, at a price which would make it attractive to the purchaser, if such purchaser only knew those merits as well as the salesman did. Without such condition of affairs to beget such confidence, no man of conscience can successfully sell gas, or anything else; and without such a confidence, no conscientious man can ever hope to succeed in making prospective customers see things in a light that would redound to his own advantage. A good quality of gas, delivered to consumers with as little annoyance as possible, at a price reasonably low, are absolutely essential as conditions favorable to the sale of a satisfactory amount of gas. Of course, there is an ultimate limit to the possible amount of gas which can be sold in any community, and capital invested in the manufacture of gas needs adequate return in the form of dividends; but it must be assumed in this paper that each Board of Directors controlling such undertakings has given these two important matters sufficient consideration to warrant the salesman in the belief that his product is of the best, and reasonably cheap.

It is perhaps equally important that the Board of Directors should carefully canvass the situation, and decide upon the degree of liberality to be exercised in the extension of mains. The advantage to be derived in this direction from a progressive spirit, and the confidence in the stability of the gas business, is too patent to need any discussion; and the influence upon the would-be consumer of a prompt agreement to extend the main to his door is the most salutary; and can best be expressed in an experience of my own in one of the small cities with which I am connected.

The previous management had been exceedingly conservative; and although the city had more than doubled in population in the preceding decade, as shown by the United States census, less than 3,000 feet of new mains had been laid during that time. However, once in a while, the company enjoyed a spasm of good intentions and was wont to canvass certain streets. I have in mind one block in particular, requiring an extension of 806 feet of main. For three successive years the gas company canvassed this block, and the least number of signers which it secured at any time was twelve, but yet the main was not laid. Shortly after the new management assumed control, the same block was canvassed again, for the fourth time. We found it impossible to get an order to connect a single house with gas. The people felt that they had been abused, and each one told our canvasser that he had gotten along so far without gas, and thought he could continue to do so. Upon learning the cause of their dissatisfaction, the main was promptly laid without more ado. As a result, every single house in the block was connected with gas inside of a year and a half.

In the mind of the writer, the above conditions which have been enumerated are absolutely essential before any company manufacturing gas can hope to sell anything more than the least possible amount with which the public can get along. These conditions must be prepared by those who are financially interested in, and direct the policy of each company. Without them the energy and intelligence exercised by the management will count for but little.

The full measure of labor in employing these conditions to their utmost falls upon the managing department of the company. The manager himself must be a careful student of human nature. His assistants must be chosen because of their fitness for their particular branches of work, The spirit of courtesy and the desire to sell something which will be of value to the consumer must be thoroughly impressed upon every employee who comes in contact with possible customers. The number of assistants must be sufficient to give each one, and particularly the executive head of this branch of the business, plenty of time to consider ways and means for advancing the sale of gas. These ways and means are so many in number and of a character so diverse, depending entirely as they do upon the conditions and habits of the community, that it would be utterly impossible to cover the ground in a conscientious manner in anything short of a life time.

In general, I think it can be candidly stated; we must go before the public offering gas as the most desirable light; the ideal fuel; and in many instances the most convenient and economical power. The salesman must believe that gas is the most desirable light; he must realize the actual competition which it meets and be prepared to submit to the possible loss of a customer where there is actually a good reason why either kerosene or electric light should be used. These instances will be so few as to cut very little figure in the general result, and it is useless to waste time, energy and money in attempting to bring about a condition of affairs in

which a customer buys something which he does not want. Our business differs from any other retail line in this particular more than any other; when a customer is once obtained, his patronage is regular and constant. One transaction does not close the business relations between buyer and seller in many cases, and if advantage can be gained in any other line by selling a man only what he wants, how much more are we affected by following the same principle. It is no difficult matter to convince the average consumer of the desirability of gas over kerosene for lighting purposes, and there is equally little difficulty in convincing a consumer of the economy and general desirability of a first-class article of gas over the incandescent light. The great bulk of light which is sold in any of the smaller cities is necessarily sold on the lines of economy and convenience. Safety, perhaps, comes next, and it is pretty well established as the result of a great many years' trial, that gas, for lighting purposes, is a happy compromise between the cheapness of kerosene light and the convenience and safety of the incandescent lamp.

The sale of gas for fuel offers the greatest possibilities for immediate development. There are very few cities embraced in the territory covered by this Association, in which the gas companies are not able to produce a fuel that will compete in efficiency, convenience, economy and general utility, with any other agent that can be used in the kitchen. There are all kinds of ways of bringing this to the attention of the public; probably the best way is to allow the purchaser an actual trial of its merits. In every community there are plenty of men who are looking for just such chances as are offered by the gas range; men, who are perfectly sincere in their desire to secure something that will do their work just as well at a less expense, or something that will do their work better at practically the same expense as by the method which they are at present using.

The first year in which I was engaged in selling gas stoves, the company with which I was connected placed 272 stoves on trial; there were but three returned. Each one of these 269 stoves became an advertising agent, and they have probably done more to increase the sale of stoves, after the policy of setting on trial was partially abandoned, than any other factor we have ever employed. One feature which may, perhaps, be classed as setting stoves on trial, is that of placing a stove free of charge for the use of any gathering of the fair sex. Almost all church societies give entertainments during the year. Do not fail to see that they have a gas stove. We have found it extremely advantageous to donate a first-class range to almost all societies where the work of getting up the entertainment is done by the ladies of the societies themselves.

Within the past three or four years, numberless devices and schemes have sprung up for the introduction of gas ranges. I can not presume to pass judgment upon any one of them. That is a problem which each Board of Directors must work out for itself, and upon which only those who are entirely familiar with local conditions are competent to pass. The best all around scheme which I have known as yet is that of hustling gas stoves by means of thoroughly advertising their merits. A friendly understanding with hardware dealers, plumbers, architects and builders, cannot fail to be very profitable, but all this takes time and costs money in some form or other, and there may be some better and newer plan developed. Whatever the plan may be, it necessarily involves an expenditure of both time and money. If you work up a large business in gas for fuel, you will have to pay for it by the expenditure of both. Do not expect to get something for nothing.

The merits of gas fuel for heating are probably just as decided, but the field is somewhat more circumscribed than that for cooking. There are many devices for increasing the sale of heating stoves, and from my own experience, I can say that some of these work exceedingly well.

Prior to the beginning of the present financial depression, along in the latter part of 1893, one of the companies with which I am connected had sold a great many heating stoves. From that time until the first of January of the present year, the sale was very much limited. About that time a gentleman approached me with the following proposition: He offered to furnish each one of our customers 8 feet of hose, of first-class quality and an independent fitting for $2.00, and to add to this, without further charge, a very nice little heating stove and connect it up free. Of course, we furnished the labor and did the connecting and paid him a small commission besides. It resulted in the sale, or gift, or whatever you choose to call it, of 230 stoves in less than three weeks. When the eagerness of the public had abated to a certain degree, he went to another field, leaving us 20 more of his stoves. These were given out immediately, upon the same terms, and since that time we have added, perhaps, 15 more, a total of 265 heating stoves, sold in less than a month, in a town of 23,000 or 24,000 population, in which already more than 700 heating stoves had been sold; but in this case, as in every other, the personality of the salesman was a great factor.

The opportunity of developing the sale of any amount of gas for power should be important, but, in most instances, seems very difficult. But the same principle must necessarily apply. The convenience and economy of the power user must be considered, and whenever we can demonstrate to such a man that we have a better power, or a cheaper power than any other, the field for the sale of gas for power will be greatly extended in all of our manufacturing cities. In my own case, I have absolutely lost the opportunity for any immediate sale of gas for this purpose, because at the critical time in its development, the prices of gas engines were so exorbitant and the conditions under which they were sold were so ridiculous that I had not the effrontery to make them known to possible customers.

Perhaps my own experience is not a fair index of the gradual change which has been made in the general idea controlling the business policy of gas companies engaged in selling gas in the small cities of the Middle West. My first lessons in the "mysteries" of the gas business were learned at the feet of a superintendent who had managed a fairly profitable institution for nearly 25 years (operating for the greater part of that period under an exclusive franchise). He had accumulated a competence during early life by the "ancient and honorable occupation of tilling the soil." At the age of 40 or thereabout, he was induced to join an enterprise which had for its object the building of a gas plant in a thriving little city. In this he invested most of his accumulations, and at once assumed the general direction of its affairs, financial and mechanical. As above related, his early business knowledge had been expended in an endeavor to produce something. The world had always been ready to take the product of his labor. He had given no thought to the market for the commodities which he had to sell, and as a consequence, after 30 years' experience as a gas man, he went to a well-earned reward with unshaken faith in the doctrine that you can only "sell so much gas anyhow," and an equally firm conviction that no human being ever burned one single foot of gas for pleasure, comfort or profit, or in fact, for any other purpose, than to have a chance to "growl at the gas company."

How much more enjoyable would have been his business life, and how much more profitable to his company, had he surrounded himself with competent help and devoted a part of his work and worry to show the public that he really wanted to sell an article of merit at a reasonable profit. That the public is susceptible to this education, and that this knowledge on the part of the public is of great value to the company, having money invested in the manufacture and distribution of gas, are being proved every day by all of the members of our fraternity who follow the usual laws of trade.

Discussion.

Mr. Highlands—With the general tenor and object of the paper just read I am in full accord, as I am sure we all are, but I slightly disagree with the general application of the principles as laid down in the article. In the first place, I slightly disagree with Mr. Copley when he puts the selling of gas or the general conduct of the gas business as a question of conscience. I frequently feel as though I can sympathize with the man who had just had a mild attack of religion, and one of his old customers asked for a prompt settlement of a long outstanding bill, because, as was generally understood, he had turned over a new leaf. The man replied "that business was one thing, and religion another," and he never allowed them to interfere. It occurs to me that the principal difficulties that gas men have had in the past, arose from their not fully realizing the character of the business in which they were engaged. I assume that when a city through its representatives grant a franchise to a gas company, or any kindred organization, permitting them to use the public streets and highways for the conduct of their business, and that when the company accept those privileges, there is an implied obligation on the part of the company to treat the citizens of that community fairly. I assume that the capital

invested in the enterprise is entitled to a fair return, and nothing more than that, and that in dealing with the city officials or citizens themselves they are entitled to frank, open, and generous treatment; and the very nature of the business would render that method of doing business almost obligatory. The market for a gas man's products is necessarily circumscribed to a comparatively small territory, and the goods must be sold within that territory, or not at all. I also assume that when there is any ill feeling between the management of a company of this kind and its customers, that it requires at least both parties to make the quarrel. In my past experience, when I discovered ill feeling breeding between the company and the citizens of the city in which they were doing business, I found that the easiest and surest remedy for the difficulty was the immediate discharge of the manager and the substituting of one who fully appreciated the duties and obligations which he assumed. When we apply that principle to selling gas, we find that we should handle our product just as any other business man who depended on the goodwill of the community for his success, and that the successful gas companies are those which deserve success. It has been the result of my experience that a successful salesman (whether of gas or any other commodity) is one who will not misrepresent goods in order to make a sale, and that, coupled with business sagacity, is the only necessary qualification of a salesman. And what I say in this connection is said from the standpoint of one who has filled all the positions possible in a gas company, from a lamp lighter and stoker to that of president and manager. Mr. Copley conveys the inference that a man to successfully sell gas, should be thoroughly familiar with gas and its possibilities. I am not so sure that his position is correct. At our works we have a record that shows every house on the line of our mains, with the name of its owner and tenants, as to whether they use gas in any form or not, and the possibilities of securing as customers those who are not so already. This record was corrected at least every two years, and lately every year. In correcting up this record we have never had it done by our regular employees, but usually by some man out of employment in the city who is personally acquainted with a great many people in the city. We have just completed this year's record, and in doing it we hired a young hardware clerk who happened to be out of employment, but who had very extensive acquaintance in this city, to make this inspection for us. Now, remember, he knew nothing at all about the gas business; I doubt if he even knew how to put on a gas burner. We instructed him along what streets our mains were laid, and then asked him to go into every house along the line of those streets and make a memorandum if they were using gas and as to what appliances they had; if they were not using gas, as to whether there was a service in their cellar or not; as to whether they had a gas or gasoline stove; also, if not consumers of gas, what they thought of the general principles of using gas; as to whether it would be worth while to try and induce them to burn gas. We also told him, where it was possible to do so, to sell a gas stove, or to contract for piping the building for gas, putting in fixtures, stove, etc., we having given him a catalogue of gas stoves with the discounts, and told him the general cost of piping a building. The result of the inspection showed that along our 17 miles of main there were 175 possible consumers. Out of that 175, this young man contracted to pipe 34 houses and sold about 40 stoves (this includes the gasoline stoves that were changed over to gas stoves). The work occupied two months and cost us $100 for the man's salary. Now I question whether we have a man who is regularly in our employ that could have accomplished the results that this man did. Our story to our prospective customers gets to be an old one after a while, and it very frequently occurs that, after talking to a man too often on the same question, when you meet him again he will close up like a clam. This young man knew nothing at all as to our business methods, our aims or intentions, and only knew about the class of business he was sent out to do; and, being intelligent, he did that. In addition to that we are constant and persistent advertisers during the season when gas stoves can most easily be sold. We now find, as a result of this work, that in 55 houses gas is used for illuminating and not for fuel. The result of this method of doing work is that we all the time know where our prospective customers are to come from, and what we should or should not do in order to secure new business.

While our city is a small one, the manager of the gas works makes no effort to become personally acquainted with the customers. On the contrary, he makes a persistent effort not to come in direct contact with very many of them, preferring to remain in the background, and to allow the clerks and ordinary employees to do the work which has generally been supposed was part of the business of the manager; and the directors of the Company have gone on the business principle that when they had a manager in whom they had confidence, they turned the entire management of the plant over to him, without giving any thought or consideration to what was being done, but looking to the results only.

Mr. Wm. McDonald—I have listened with pleasure to the reading of the paper by Mr. Copley, and it is my desire, if possible, to bring out into plainer view the golden thread that I think runs through his entire paper. He is a believer in gas, and no one can make a success of selling any article or commodity unless he thoroughly believes that it is the best for the purpose for which it is designed. I believe that very many gas managers fail to reach the highest success in the business of selling gas because they do not themselves fully believe it is the best. "Thrice armed is he whose cause is just," and not only must the cause be just, but the fighter must believe it is. So, in selling gas or anything else, the seller must be sure he has a good article to sell, and then go to work as though he does believe it. I do not altogether agree with the writer that there is necessarily a difference in the management of the gas business in a small town or in a large one. It has been my good fortune, during the many years that I have been connected with the gas business, to meet nearly all of the men who are selling gas in this country, and I have many times noted that the successful gas manager is the enthusiastic one; and not only is he enthusiastic, but he is courteous and pleasant to everybody. The writer in making a distinction between the management in a small place and a large one, says that the manager of the small plant comes more closely in contact with his customers, therefore the customers get his ideas directly from him, but that the manager of the large plant is dependent upon those under him for the success of his work. True, but I believe it has always proved to be a fact that if the head of a concern believed in its product and its necessity to the public, the subordinates very soon became impregnated with the same idea. If the head of the management is courteous and pleasant to everybody, and insists upon the same politeness on the part of the subordinates, they rarely fail to represent his ideas to the people whom they meet. It is often times one of the hardest things for the manager of a large concern to realize how soon his ideas are adopted and carried out by those who are under him and coming in daily contact with him.

I am fully in sympathy with the energy and ingenuity that have in the past few years so greatly improved the methods of making gas, but with the gas business, as with all other kinds, the product is of no use unless a buyer can be found; therefore I believe that to-day the methods of selling gas are worthy of the most careful consideration and best efforts of those engaged in the business.

Listening to Mr. Copley's paper it is easy to realize that he has not only given careful thought to the disposition of the gas seller, but has also considered carefully the best means of making gas a convenience as well as a necessity to the customer. At the bottom of page 5 he says, "A friendly understanding with hardware dealers, architects and builders cannot fail to be profitable, but all this takes time and costs money in some form or other." I very fully concur in this statement, and would if possible emphasize it. Could the gas manager by a moderate expenditure of time and money secure in his city a few buildings that were built for people of moderate means to live in, in which the burning of gas for cooking and fuel purposes was made a prominent feature, he would have helped very materially to solve the problem of selling gas. Great success has been attained in Great Britain by these methods. The gas companies have spent money enough to put gas at the elbow of the consumer and left it there to be used or not as they might elect. In almost all cases it has been used, and in larger quantities than was anticipated.

This is also true in the city of New York, and very great success has been and is being attained by persuading the common people to use gas, both for fuel and light.

I was asked by the Secretary to be one of those to discuss this paper, and a careful study of it convinced me that although short, it was full of suggestions that would prove of great value to those engaged in the business of selling gas.

Mr. Egner—I would ask Mr. Copley why they abandoned setting gas stoves on trial? He says it was a pretty good thing to do and yet they abandoned it. Another thing, Mr. Highlands criticises ad-

versely Mr. Copley's recommendation to employ a man who thoroughly understands the gas business, and he mentioned the good work he had done with a man who knew nothing about it. I would ask what he might have done had the man understood the gas business? (Laughter). I want to speak of my own experience in selling gas stoves in a small way. I found it a very good thing to send a man to a grocery store with a few stoves, stay there two or three days, and then go to another one and so on, and we had no difficulty in getting the consent of the grocery keepers; everybody that came there to buy goods saw the stoves and it was a good advertisement for the gas company.

Mr. Copley—In answer to Mr. Egner's question, I think if he will read what I said carefully, he will find I said we only partially abandoned it after pretty well covering the territory, and then only after we had sold gas stoves to almost every one who would not be likely to want to get the better of the gas company. We, however, continue to set gas stoves on trial for every new and reputable customer in town, and who would like to have that sort of thing if it was satisfactory to him. In answer to one or two criticisms of Mr. Highlands, he quotes me as saying that the salesman must thoroughly understand the gas business. I cannot recall any place in the writing of that paper where that was said. What I do say is that he must be thoroughly saturated with the idea that gas is the cheapest and best fuel a man can use. This matter has no personal significance whatever. I would like to suggest to Mr. Highlands the fact that a man who has a mild attack of religion is, perhaps, a more dangerous man to deal with than one who has a seven-day-in-the-week conscience.

Mr. Highlands—You have my sympathies.

Mr. Copley—Perhaps he has misconstrued the tenor of my words. We have the same suggestion to offer as Mr. Egner. If that hardware clerk had lived in Aurora or Joliet he would be in the employ of the gas company. Mr. Highlands says he finds that men—possible consumers—become tired of being talked to too often. So do I. I do not mean to have the salesman talk to them too often. Mr. Highlands also says he does not want to be known. I cannot see any particular reason why a man with a seven-day-in-the-week conscience should not be known to his possible or actual gas consumer. My experience is that most of them like to know the manager. I like to have them know him. I like to know them.

By knowing the habits of the possible customers and their associates, I think it can be shown that a great deal of advantage is to be derived. I will give an illustration. Supposing Mr. A., living on a certain street, does not use gas; he owns his property, is in moderately comfortable circumstances, either a thrifty mechanic or merchant, or in such circumstances that he ought to use gas. Suppose he has a cousin or brother, or his wife has a relative engaged in some line of trade or profession. It is advantageous to know those circumstances, and when our clerk puts that man's name on my desk, he also notes his associations, his relatives, if he has any, or who are engaged in business, and it does not take very long to get some string on that man, to sell a stove to him, or to some of his relatives, a cousin of his own or of his wife's, who is selling hardware, or is designing houses, or some one else whom we know is using gas, or who has an ultimate profit which he hopes to derive from the sale of a stove to that man.

Mr. Highlands—I must say that I admire Mr. Copley's definition of the conscientious man. I find now that he is the man who will use his prospective customers, sisters, cousins and aunts to assist him if he has to. We agree on some of those facts. As to Mr. Egner's question; it is probably a matter of conjecture. I know the work was done. This method of checking up is such that a man in checking may have no previous information at all to go by; the information, however, which he brings must absolutely have been acquired by himself. We have a method of knowing by a previous record whether the inspector has accomplished anything. The record is worth keeping up. We use it also as a rating record, and when a prospective customer comes in it does not require a bookkeeper more than a few minutes to find out whether we care to sell him a stove or not.

Mr. Jones—All the points brought out by Mr. Copley have been so admirably handled that criticism seems almost impossible. He puts electricity on the top notch, however, as regards safety, and this, I think, is slightly in error; gas should at least stand on an equal footing with its rival. Underwriters generally consider electricity very dangerous and I beg leave to read the following extract from an insurance journal on the subject:

"It is unnecessary for us to state, after the articles that have appeared in the *Oriental*, that we do not favor electric lights. We believe the system is the worst firebug that has ever been introduced into our business. It is almost impossible to get perfect wiring for the reason most people let the job to the one who will do the work the cheapest. And even when well done there is a great danger of short circuits from telephone and other wires that make such lighting dangerous. The man who has an open arc light without a spark arrester is but little better than an incendiary, and we don't desire his business. The Hartford (Connecticut) Board of Underwriters has established an extra charge of one-half per cent. for such lights, which will compel attention. When any of your customers are using coal gas for lights discourage any change to electricity. Gas light is cheaper and infinitely safer."

Mr. Copley—I would like very much, in justice to myself to say, that I think if my paper is read carefully, these instances will be so few as to cut very little figure in the general result. Regarding the preference, as to the use of kerosene or electric light, there are places in which, you will agree, the incandescent light is safer than an open gas burner.

Mr. Jones—I referred to this passage: "Safety, perhaps comes next, and it is pretty well established, as the result of a great many years' trial, that gas for lighting purposes is a happy compromise between the cheapness of kerosene light and the convenience and safety of the incandescent lamp."

Mr. Copley—If you will read the first part of that paragraph you will find I did not bring that out as clearly as I should, I only mentioned some few isolated cases.

Mr. Doane—This is one of the most important subjects that can be brought before this meeting, for while it is important to know how to make a gas stove, after all we have to sell it. I have had a little experience in this line, and as this is something like an experience meeting, we want to get the results of experiments on this line. Last summer I employed a young man who had been using a gas stove for a number of years. He knew well of the benefits derived from the use of it, its economies and its conveniences, but he knew nothing about the gas business. I sent him out with orders to visit every house on the line of our mains, and gave him a list of people. Whenever he called at a house where they had a gas stove he had orders to make inquiries as to the results derived from their gas stoves and burners, and to report to the office. He tried to sell gas stoves where they were not using them. I think for five years after I first took hold of the gas plant at Jacksonville, Ill., I averaged about 50 stoves per annum. That was in good times. The last two years, up to last year I sold about 30 or 35 stoves. We sell gas at $1.50 net, both for illuminating and fuel purposes. The year I sent out this man we sold 70 odd stoves, which in a town of 14,000 people was very good. Judging from the way we sold stoves, and those in use before, we must have had 300 stoves out, and I think the results were good. I cannot help but think so in times such as those of last year. With the stoves, we put in the service free and gave every customer, whether old or new, $5 worth of gas to be used during the season. We are doing that same thing today, being pleased with the result of last year.

The President—Will somebody else give us his experience in this line? Mr. Cowdery, give us your experience.

Mr. Cowdery—I do not think I have anything to say on the subject at present. I believe anyone who devotes his energies thoroughly to selling gas in any of the ways the gentleman mentioned, will be successful.

Mr. Doherty—I would like to say something in this discussion regarding the methods used by the various companies to introduce gas stoves. Mr. Copley's paper has been more in general than I expected—how to sell them and set them up, etc. I have very tender feelings on that subject. I read a paper in this same room about 15 months ago on the same subject—the same title, I mean. The thing that strikes me as most worthy of consideration is whether we cannot get our customers to use their stoves in the winter. Everybody, or almost everybody, stops using them as soon as cold weather comes. Now, I have written all the dealers in our town requesting them to furnish a stove that will heat the kitchen in winter time; then we will advocate the use of the gas stove the year round. One little stove I had furnished me, that holds fire for 48 hours, can be sold for $4.50. Of course it is just as economical a heater as a kitchen range, and a good deal more so. Another great drawback to the universal use of a gas stove is the fact that we cannot heat water with any degree of economy. If we

could devise some way to give our customers hot water at an economical figure, we could hope to retain our gas stoves in use for the greater portion of the year. In some houses, that can be done by heating water from the furnace, and I believe in some instances the people would be fairly well satisfied with the instantaneous water heater. We have always objected to the instantaneous heater because it made heavy demands on the meter. They burn no less than 70 feet of gas an hour, and should always be connected with a flue, on account of the fact that the combustion is very apt to be imperfect in them. I never advocate the sale of hot plates. A man comes in to buy a gas stove; we try to sell him a range. As a last resort we bring out a hot plate. In almost all cases we induce him to buy a range; we try to sell as large and as expensive a range as we can, not expensive to operate, but in first cost; we try to get him to buy a range that will be serviceable, and if he buys an expensive one, he does not want to discontinue its use. The gas stove business is not developed to its full extent. There is virtually no house that could not afford to patronize us, and we can find some way to make it possible for them to acquire a stove. If we watch it to see that it is used carefully, I think we can sell more gas than heretofore.

Mr. Wm. McDonald—The gentleman suggests a thought to me in connection with heating water by gas. I think it is one we all ought to realize. It is not possible to heat a quantity of cold water with a very small quantity of gas. The heat is not there to do it. It takes 75 feet of gas to heat the water with the gas heater. Suppose his customer is told it takes 75 feet of gas to heat enough water and it will cost him 10 cents. Very few people when they get ready to take a bath will let 10 cents stand in the way. I believe it is better to have it thoroughly understood that you cannot heat a large quantity of water from a low temperature and bring it to a high temperature with a small quantity of gas.

Mr. Doherty—Just one thing. I do not think Mr. McDonald caught the drift of my objection to the heater that takes 75 feet of gas. The instantaneous heater I do not consider expensive at all; in fact, I have one connected up to supply water to my bathroom, and it is very economical, but I do object to putting instantaneous water heaters out and advocating them, because in a great many instances you cannot give them quite enough gas. The service pipe is too small, and they are very hard on the meters. You draw on the meter when it is supplying all the gas in the house for 75 feet additional, and it is very apt to injure the meter if the meter is at all weak. I believe the most satisfactory way of using hot water is to have a constant supply on hand, and if we could purchase a heater that comes somewhere near the theoretical possibility of a water heater and place it as near the boiler as possible, then cover our pipes leading from the heater to the boiler with insulating material, we would find that the cost of maintaining a constant supply of hot water would be greatly reduced. Furthermore, as counterbalancing the heat that radiates from the kitchen tank would require the continuous consumption of a considerable amount of gas, the use of the insulating material reduces that.

Mr. Jenkins—The best way to remedy this would be to put in a larger service and meter. I am decidedly in favor of selling all the gas we can; it does not make any difference whether it is 75 feet or 750 feet.

Mr. Wm. McDonald—It seems to me there is a little mistake on Mr. Doherty's part on the meter question. I think I can make that clear. I am not advocating a small meter or a small service for a large supply of gas. It will not hurt the meter to give it a little hard work once in a while. I think the gas company can stand it.

Mr. Highlands—In view of one suggestion of Mr. Doherty, I would say if he or any other manager finds a customer who is apt to call on him for more gas than his service will supply he will find it greatly to his comfort and advantage to put in a larger service pipe.

Mr. Russell—This discussion of fuel gas is very interesting. I am rather young in the gas business and would like to ask some questions for information as to the profit. I know some companies make a difference in the price of gas. Say they sell gas for lighting at $1.60 a 1,000 and gas for fuel at $1. I would like to know how the companies can make such a great difference in rates. I want to see how they figure out a difference of almost 40 per cent. for the same gas for different purposes.

Mr. Highlands—I presume our company make as great a difference in price between illuminating and fuel gas as anyone. We charge $1.75 for gas for illuminating and $1.25 for gas used in stoves, and I frequently met with the same question that the gentleman puts. Five years ago in that small town gas sold at $2.50; we first reduced it to $1.75 net, and then commenced the use of gas stoves, assuring our customers that the increased use of gas would bring the price of gas down. They have also been told that next year we could probably afford to sell gas at $1.25 all round. I do not think our directors have any more right in the matter than our customers have. Their first right is to get a fair interest on their investment, and their rights stop there and belong to the customer. A very liberal patronage should be met by you with just as liberal treatment. If on a small consumption you would attempt to drop from $1.75 to $1.25, your directors would probably ask how you were going to pay dividends, interest and expenses.

Mr. W. Forstall—Referring to what Mr. Russell says, circumstances alter cases. Where we have small gas works, retort house labor would be the same whether we make 50,000 or 75,000 feet in 24 hours; if you can sell the extra 25,000 by putting out gas stoves you will see that the extra cost of 25,000 feet will be very little. Taking into account many facts of that kind we figured that last year we made a return of about $1,500 on an investment of about $1,800, and when a customer asks how we can sell fuel gas at $1.20 as against illuminating gas at $1.50, I bring up the illustration that a merchant can sell goods cheaper in large quantities than in small. If he can keep his clerks busy all the time it is to his advantage to sell cheaper. So we feel justified in the policy of making the price of gas for fuel cheaper than for illuminating. We put the stoves out at cost, and run the service from the main to the meter free of charge. We expect to sell, perhaps, 200 stoves this year in a town of about 16,000 to 18,000 inhabitants, and make a profit of about 50 per cent. on our investment.

Mr. Roper—I would like to say something regarding to the use of gas stoves all the year round. Mr. Clabaugh, of Omaha, has, I think, the best method that I know of for heating the kitchen where they use the stove the year round. I believe he uses it successfully now and has done so for at least three years. He put it in his house and I put it in my house a year ago. It is a piece of pipe 4 inches in diameter, both ends capped; a hole is drilled in the end of the cap for the cold water inlet, carrying the water down about two thirds the length of the pipe, which is six inches long. The hot water outlet, of course, only enters into the cap about half an inch so as to screw through. In other words, you make a perfect circulating boiler such as is used for hot water with ordinary ranges, ordinarily known as 30-gallon tanks. If you place one of them in the heater and swing it above the fire grate so as to prevent the grate from lifting, shaking, or anything of that kind, and high enough above the door so that in feeding the coal it does not interfere in any way whatever, you have plenty of room in the boiler. If in the spring or fall, when you are running your house heater low and your fire is banked, this pipe or circulating boiler, which it really is, will be buried about half way in the fire. If you place a coil before it enters the tank, in your kitchen, you can heat your kitchen successfully with the 4-inch pipe, 6 inches long, in your house heater and keep the kitchen, even if a large one, heated so that you can use the gas stove all the year round.

The President—How much coil in the kitchen?

Mr. Roper—That depends on the size of the kitchen. You want radiating surface enough to heat it. I think his kitchen is about 14 feet square. I do not know how much radiating surface he has.

Mr. Wm. McDonald—This discussion only emphasizes a point I desired to make, and that is why not have the architects and the people who build houses provide heat in the kitchen as well as the rest of the house? That is one of the great points. If the house is built to take care of the matter of the introduction of the gas stove, its use all the year round becomes a very simple matter, in fact becomes almost a necessity. I would like to impress that very strongly on the people who are here, because I see great results for it in the future—the house should be built and prepared for the use of gas for heating and cooking.

Mr. Doherty—What I said about kitchen heating was not qualified exactly as it should have been. I believe every man should take steps to have furnace heat to run through every room in his house where it is possible; but many old-fashioned houses have no furnaces, or having one, are not in position to run a pipe to the kitchen without either costing too much, or without it being impossible. I was merely trying to get at a way to heat the kitchens in

houses of that sort. If you do not have a stove or some other way of heating they will be very apt to try to heat with a gas stove, and then their bills will be too high. A small, hard coal stove ought not to be very expensive. Cooking with gas all the year round ought not to cost more than to cook with coal in the winter time, and the convenience ought to make up for that; but I especially referred to houses where it is impossible to get other heat, too.

On motion of Mr. Highlands a vote of thanks was passed to Mr. Copley, after which the Association adjourned, to reassemble at 2 P. M.

FIRST DAY, AFTERNOON SESSION.

The afternoon session was commenced with the reading of the following paper, by Mr. J. R. Lynn, of Detroit, on

AN OIL-TAR SEPARATOR AND ITS RESULTS.

About one year ago the Detroit Gas Company received a notice from the health department of the city demanding the abatement of a nuisance created by the entrance of sewage from the works into the river. Within a short time after the service of this paper another of similar import was received from the State Fish Commission, ordering the company to take measures at once toward preventing the entrance of refuse matters, which they averred were killing the river fish in alarming numbers. Previous to this time we had been considering the advisability of endeavoring to make some practical use of the tar produced by our Lowe apparatus. The action of these commissions made it imperative that our theories should be put into such practice as to enable us to realize upon a compulsory investment.

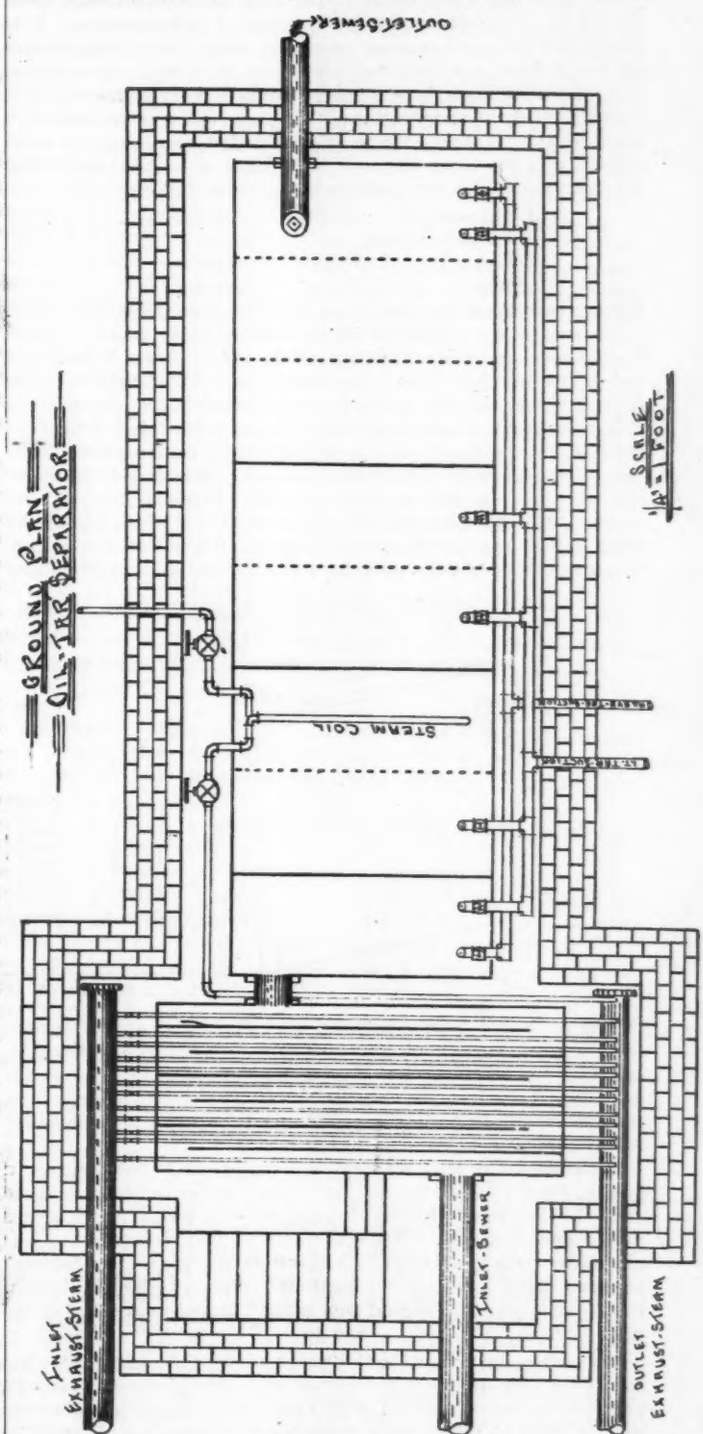
Among the direct products of our plant entering the sewer of which complaint was made, were:—the drips from our holder connections, purifiers, and street mains; the refuse from the ammonia concentrators and the Pintsch gas plant (with the exception of the hydrocarbon produced in the latter) and the emulsions from the seals and scrubbers in the water gas plant. In order to thoroughly avoid the possibility of any further trouble, it was decided to run all this sewage through a separator especially designed to prevent any obnoxious matters from entering the river, and at the same time to recover all to which any value could be attached.

Interesting papers bearing upon this subject have been produced at two sessions of the American Gas Light Association, and were successful in producing beneficial discussions, but much of a valuable nature remains untold. Indeed, I firmly believe that in the future of the gas industry, the by-product of the water gas plant is destined to become an important factor. No approach to complete separation of carbureted water gas tar can be obtained except under special conditions, owing to the very slight difference between its specific gravity and that of the water contained in the emulsion. It must be conducted at a temperature of not less than 70° Centigrade with the liquids kept at that point for a length of time sufficient to allow them to come thoroughly under the influence of the heat. It is apparent that the production of the plant, the amount of heating surface, and the dimensions of the separator employed should be proportionate. The total amount of heating surface from the steam coils of the separator at our plant is somewhat in excess of 22 square feet, and the maximum daily consumption of oil during the past winter amounted to 4,500 gallons, but the production of tar is of more importance than the consumption of oil.

Of the quantity of tar produced from a given amount of oil no definite portion can be stated, as the quality of oil and condition of the plant itself must be considered. Naphtha produces a smaller quantity of tar than does the Lima Proof gas oil; the recovery from which in our case varied from 8 to 15 per cent. in bulk, or from 9 to 17 per cent. by weight; while from crude oil the percentage would be greater. The gas oil used by us at present has a gravity of .83 or 40° Beaume.

The amount of tar recovered may be considered a good index to the condition of the plant. For a time when our percentage was at a maximum, the apparatus was closely watched and traces of undecomposed oil in the tar were plainly perceptible. As our heats were regular, we concluded to place vaporizers of great length in the Lowe plant. This remedy was successful and not more than 8 per cent. has been recovered since their substitution, while our journal has shown better yields of gas per gallon of oil. Had we not been in position to observe what was transpiring in our separator, as we were certainly unable to determine previous to its operation, our plant may have run on for some time with a waste of material.

The amount of tar from the Pintsch process amounts to about 15 per cent. of the oil used, but as the output of the plant is small we have been in the habit of pumping it over into the same tanks in which carbureted water gas tar is stored. Considering the higher specific gravity, the Pintsch tar in reality amounts to almost 20 per cent. of the weight of oil. At times the drip water from the street mains has contained a liquid substance similar to the hydrocarbon precipitated from the Pintsch gas upon compression; and as the water issuing from the separator outlet has been free from oils



or tars, this also has been separated and stored with the other recoveries. In quantity it has not amounted to much, as the drips received include those only of the western portion of the city, but it is to be found to some extent in the holder or street main drips wherever carbureted water gas is produced.

The composition of the tar produced by the Lowe process is so varied that it would be a difficult matter to give an average of the

constituents even approximately. From the best authorities upon the subject it may be presumed that the following percentages would be obtained from the distillation of the dehydrated tar:

Light oils,	24 per cent
Intermediate oils,	14 " "
Heavy oils,	10 " "
Naphthaline,	14 " "
and pitch,	38 " "

The light oils yield about 15 per cent. of pure benzene, large quantities of paraffines and also some liquid hydrocarbons. It is nearly free from anthracenes, excepting where high temperatures are maintained, and then they are found in a very impure state. The oil tar as made in a Pintsch works is very different, as it consists chiefly of hydrocarbons of a high boiling point similar to those of the oil itself, which in distillation pass over as intermediate oils, the composition of which they almost entirely form. A percentage of this tar might be estimated as follows:—

Light oils,	10 per cent.
Intermediate oils,	60 " "
Heavy oils,	15 " "
Pitch,	15 " "

Neither anthracene nor benzene is found in perceptible quantities.

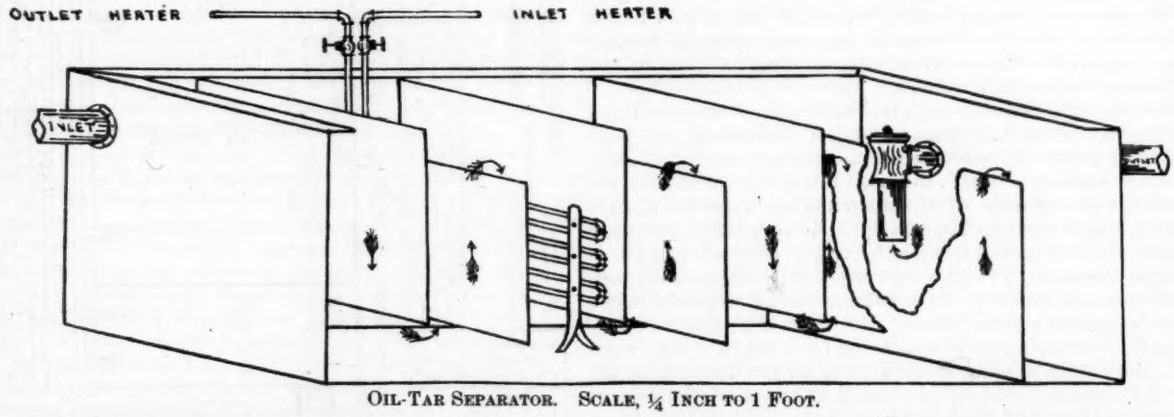
The apparatus constructed is enclosed by brick walls 16 inches in thickness, extending from the earth surface down 13 feet, or 3 feet below the floor line. The bottom is a water-tight concrete floor, a description of which is as follows:—First, concrete was laid 10 inches in thickness and after it had settled, two courses of brick laid flat were added with 1 inch of Portland cement mortar below the first course, between it and the second and also above the latter. It was also necessary, in order to make the enclosure as nearly water-tight as possible, to plaster the walls to a height of 5 feet with a coating of cement mortar ½-inch thick and to construct a covering consisting of three layers of 2-inch planks, resting on heavy beams, between each layer and on the outside being a heavy coating of pitch and sand. Openings 3 feet square, and four in number with trap doors arranged to prevent the dripping of rain from above when closed, were left in this covering to allow ventilation when required and to permit workmen to get at any part of the apparatus if desired.

In the enclosure are 2 wrought iron tanks, one 10 feet 2 inches in length, 4 feet 1 inch in width, and 1 foot 4 inches in depth; and the other having the following dimensions:—20 feet, 6 feet 8 inches and 6 feet 4 inches. The first tank is laid crosswise in the enclosure while the second is lengthwise, the connection between the two being a 10-inch wrought iron pipe, 8 inches in length, the upper level of the second tank being 8 inches above that of the first.

The sewage is conveyed to this first tank by a 10-inch inlet, entering at the side adjacent to the west end. In this tank the liquids pass through seven sections, which are open alternately at the ends and in each of which they must come in contact with two 1¼-inch pipes running from end to end, and fed with the exhaust steam from the works by a 6-inch pipe, the outlet being reduced to 3 inches in order to obtain the best results. As there is a large amount of condensation, it is obvious that this reduction in no wise causes increased resistance upon our machinery. The partitions in this tank are equi-distant, run to a height above the water line, which is about 7 inches from the top, and the alternate openings are 6 inches in width. The temperature is maintained at 160° Fahrenheit at the outlet where the liquids are allowed to pass into the second tank.

This latter is divided into 8 sections; the first, third and fifth partitions rising from a line 18 inches above the bottom to the top of the tank, while the second, fourth and sixth extend from a line 12 inches from the bottom to another 18 inches from the top, being so arranged as to permit the liquids to overflow. The seventh partition extends from the bottom to a line about level with the top of the sixth. In this tank we use a heater in the third section from the inlet only, the heater consisting of a 1¼-inch coil having a total length of 80 feet inside the division. This is fed with live steam direct from the boilers, regulated by a valve from time to time as required. The outlet of this coil connects with the 6-inch exhaust pipe, and whatever steam there is remaining after it has left the second tank passes again into the first.

All heavy and light tars are pumped from the second tank, the suctions being 7 separate 2-inch pipes, arranged with valves in such a manner that they can be pumped separately or in unison, as may at any time be desirable. From the bottom of the first and eighth sections the heavy precipitates are taken, while from a few inches below the liquid line in the first, second, fourth, fifth and eighth sections the lighter tars are obtained. The outlet from the last division to the river is a 10-inch sewer which dips down 30 inches from the bottom of the tank, and allows about 2 feet 10 inches at the top for the accumulation of any light tarry liquids which may arise to the surface in the last three sections; and so long as these liquids are kept above the bottom of the dip pipe, there is no danger of anything but water flowing into the river, as the heavy tars are all practically precipitated in the other sections. The discharge at the river dips down to a depth of about 6 feet, the object of this arrangement being to prevent the passing boats from washing water back into the separator.



OIL-TAR SEPARATOR. SCALE, ¼ INCH TO 1 FOOT.

From time to time, as advisable, alterations have presented themselves, changes in the original construction have been made, and it may be that there remain advantageous arrangements to perfect the apparatus. Thus far, however, we have had no difficulty in effecting a satisfactory separation in the apparatus as it exists at present, as it is the present arrangement which I had endeavored to describe in as plain a manner as possible.

The cost of the brick enclosure with the necessary excavations and the wrought iron tanks as constructed may, without any material deviation from the actual facts, be estimated as follows:

Labor of all descriptions,	$700.00
Tank and connections,	125.00
Materials for masonry,	235.00
Lumber, etc., for cover and braces,	65.00
Total cost of apparatus,	$1,125.00

An explanation of these figures is due owing to local conditions. Having on hand a considerable amount of old fire brick and other materials considered practically worthless, we made use of them in the construction of the walls, floor and cover of the enclosure. But, on the other hand, our location was unfortunate, as we were compelled to make all excavations in made earth, which had been filled in with every sort of obstructing material. The portion of our property upon which the separator was constructed is a recovery from the Detroit river, and at one time was covered by a sheet

dock. You may readily imagine the trouble occasioned by the old piling from the latter which we were compelled to remove. Probably not two other plants in the country would come into contact with these same obstructions, and I am inclined to the belief that the cost at our works was greatly in excess of what it would have been in a more fortunate location. The figures given are therefore not adaptable to the requirements of others, but were cited merely to give an idea of the necessary cost. If the cost is to be curtailed, it would not be advisable to do so by decreasing the size of the separator; in fact, I would advise an increase of the dimensions if ample ground surface is obtainable. Allowances should always be made in permanent improvements for future increase in the production of the plant.

While we have been unable to obtain a market for the tar produced, there is no doubt from the practical experiments which have been made public by several well-known gas engineers that it must eventually find an avenue to trade. It must be admitted that our results have not quite so nearly approached perfection as those claimed by others interested in the same matter. Our tar, after separation, has certainly shown an admixture with more than 1 per cent. of water, but we are able to assert that the percentage is small, the product being sufficiently free to enable us to utilize it as a fuel and derive some benefit in payment for our trouble. At the present time, the results are much more satisfactory than at any previous time, and by continued improvement in the operation of the apparatus there is no doubt even better results may yet be obtained.

An excellent oil storage capacity has enabled us to connect a spare tank with a capacity of 8,900 gallons as a receiver for the separated by-products which are pumped over from the separator. Water occasionally passes over into this tank, but in an hour after the pump has been stopped we are able to draw it off. All the tar used as fuel is pumped from this tank into a smaller feed tank in our boiler room, the arrangement of which is described below:

The tank is elevated 10 feet 6 inches from the floor line, or 7 feet above the point of injection into the furnace, and has a 2-inch overflow at the top, two 1½-inch outlets to the burner, one 18 inches from the bottom and the other directly from the bottom, both having shut off cocks, and the latter being so connected as to enable us to draw off any settlings. The overflow and draw-off pipes all lead into a sewer which connects with the inlet of the separator. The tank will give at the injector a pressure of about 3 pounds per square inch. We employ the Clayborne burner suitable for gaseous or liquid fuels with steam as an injecting and spraying agent. The outlet from the tank is reduced to ⅛ inch about one foot from the burner, at which distance also the 1¼-inch steam pipe is reduced to the same size, but the valves employed on these lines are of the larger sizes, and each is open during the combustion of the liquid, one sixth of a turn.

It is advisable to describe the boiler under which the fuel has been used in order to familiarize the members with the actual conditions. In length this was 11 feet 6 inches by 4 feet 10 inches in diameter, having sixty 3½-inch horizontal tubular flues and a heating surface of 800 square feet. The furnace underneath possessed a grate surface 4.5 feet in length by 4 feet in width, a total of 22.5 square feet. Products of combustion are carried to a stack 3 feet in diameter (inside measurement) communicating with a chimney of sufficient height to create a draft or water vacuum of 4-10ths of an inch.

At times we have used the oil tar alone, and at others, when it was not obtained in sufficient quantities to run the boiler, we have used it in conjunction with coke breeze. While working on the liquid alone we have always reduced the draft to a minimum, but when using coke breeze it was necessary to give all the draft obtainable. During the twenty-four hours we have consumed 640 gallons of the liquid or an average of 26⅔ gallons per hour. In the month of January we made merely a rough estimate showing that 19,000 gallons had displaced 90 tons of Youghiogheny slack coal, an average of 211 gallons per ton, or an equivalent of 1 gallon of the tar to 9.47 pounds of slack coal. By a practical test made on this same boiler February 2nd, 1896, it was ascertained that this coal gave an equivalent evaporation of 8.645 pounds of water from and at 212° Fahrenheit, per pound. This would indicate an evaporative power for the oil tar of 81.78 pounds of water per gallon. As the coal displaced cost in our sheds $1.57 per ton, we may therefore estimate the value of the recovery as a fuel for boiler purposes at approximately three-fourths of a cent.

Samples taken from various parts of the separator and properly labeled are here for your inspection and attention is respectively called to the drawings of a ground plan of the arrangement and an open lateral view of the second tank with its wrought iron divisions. These have been contributed for the purpose of demonstrating more clearly the foregoing descriptive matter.

Having arrived at the point where the production of carbureted water gas constitutes at least two-thirds of the total gas production of the country, it is natural that the refuse matters resulting from its manufacture should demand thoughtful attention. There are older members of this Association who can distinctly remember the day when it was thought by the vast majority that coal tar could not possibly possess a commercial value, when it would have been considered a folly for even a reputable engineer to advise an arrangement to utilize the ammonia contained in crude coal gas; when in fact with the heavy revenues derived from public lighting without the slightest opposition, and high rates for private and commercial lighting, it was not considered exactly essential to trouble about the erection of apparatus adapted to economizing on the fuel or the labor employed in the distillation of coal. Economy, which has now become in the majority of cases the very necessity of existence at a time when everything must be utilized if in any degree possible, was in those days considered a foolish extravagance. In view of the advancement made in other directions in the past few years, we may with profit to ourselves devote a portion of our time to the consideration of what should be done with the by-products obtained in our water gas plants. From being a nuisance to the gas manager and an annoyance to the ever alert health commissioner or game warden, there seems every plausible reason that it should be converted into something useful to the world at large. People in general give us so little credit for the many deeds performed for the benefit of mankind, that we as a class, which has been relegated in the thoughts of many to the dark ways of this life and consigned in advance in their frequent expressions to an exceptionally warm place in that which is to come, have every reason almost to despair; but yet by a few more persevering endeavors we may induce them to believe we have some consideration for their comfort.

Discussion.

The President—Gentlemen, you have heard a very interesting paper on the line of economy, something we all are looking for. It is now open for discussion and I will ask Mr. Alten S. Miller to lead in the discussion.

Mr. A. S. Miller—I would like to ask Mr. Lynn what percentage of water is in his tar?

Mr. Lynn—Between 5 and 7 per cent., as we get it at present.

Mr. A. S. Miller—That is not from analysis; it is simply an estimate. I should say, from the result of the boiler tests, that either the tar was burned with inefficient apparatus or else, there was more than 7 per cent. of water in it. In burning oil or liquid, fuel of any kind under a boiler, the efficiency is usually considerably higher than it is with coal. That is, the efficiency of liquid fuel is higher than the efficiency of coal, because it must be burned without an excess of air. I made a few figures here which show about 31,650,000 heat units in 211 gallons of tar, compared to about 30,000,000 heat units in a ton of coal. That would indicate a very great loss somewhere, either that it was not a very high percentage of tar, or else that the boilers were run at a low efficiency as compared with when coal was being burned. They should get very much better results from the tar. The first paragraph I noted in the paper was that it is apparent the production of the plant, the amount of heating surface, the dimensions of the separator employed, should be proportionate. I would like to say no heating surface is necessary. There is no reason why the drainage from the plant cannot be carried in at the proper temperature for separation. I quite agree with Mr. Lynn (he says 70° C., I prefer to use the American units) that 160° or 158° F. is about the proper temperature. Below this the separator should not be allowed to fall. I would like to ask Mr. Lynn what the gravity is of these oils that are given in this analysis, "light oils, intermediate oils, etc."

Mr. J. R. Lynn—The light oils are oils lighter than water, while the intermediate oils are those which practically have nearly the same gravity as water; the gravity will be very near unity, while the heavy oils are, of course, oils, which if dropped into a vessel containing water would go to the bottom.

Mr. A. S. Miller—I think Mr. Lynn is mistaken in getting his partitions too deep in his tank. As a matter of fact, in a separator there is usually about 12 inches of emulsion of water in tar between the top of the pure tar and the water. In the separator there should be an abundance of room so that the current under the partitions will not stir up the tar, and in practice I have made a minimum of at least 30 inches. There is no harm in making it 36 or 42, or more than that, if you have plenty of depth of tank, but under no circumstances should there be less than 30 inches. I think if Mr. Lynn will increase the space between the bottom of the partition and the bottom of the tank to 30 inches, he can separate, the tar down to the point where these other people claim to separate. Also, I do not see any particular use of the second heater. I think if he will run his works so the waste products are hot enough when they strike the first tank, he will not need the second heater. I would also like to know where he bought his tanks. They figure out less than half a cent a pound. I would like to buy some. We pay about 3 cents in our country. Further than that I do not know that I have anything special to say. Mr. Lynn seems to doubt that tar is being separated. He rather emphasizes that "people claim." I can refer him to St. Louis; that Mr. Walbridge, at Grand Rapids, is separating his tar to about one per cent.; Omaha I know was separating it to less than one per cent.; and Mr. Crisfield, in Savannah, was separating it down in the neighborhood of one per cent.; and Mr. Rusby, of Jersey City, is doing it also. I do not recall any more, unless I name myself.

Mr. Walbridge—I would like to ask Mr. Lynn how many gallons of water per ton, he uses for scrubbing?

Mr. J. R. Lynn—That is a question I am not prepared to answer, as the water is going in at the top, being regulated by a valve, and it is something that is left entirely in the care of the man who is manipulating the plant.

Mr. Walbridge—That is one of the most important features connected with the separation of water gas tar; for, if there is an excess of water there will be a high velocity of water in any separator you choose to put in, and the result will be inability to entirely separate the tar from the water. I believe that might be looked into with great advantage to yourself.

Mr. Beal—How many gallons of water does Mr. Walbridge use in his washing?

Mr. Walbridge—It varies with the different seasons of the year. We have used as low as 6 gallons per 1,000 feet with the ordinary Lowe double super heater apparatus. The lower you can get it down, and still send out your gas clean, the better it is for your water gas tar separation.

Mr. Beal—I want to get at how much water you use in the scrubbing. For instance, does it go from the condenser into the scrubber?

Mr. Walbridge—Yes; 6 to 12 gallons would be the average.

The President—Mr. Egner, have you not had some experience in this line?

Mr. Egner—I have only this experience. We had the Health Board of the City of New York after us at one time and they had been making our life a burden almost. They objected to our discharging the overflow waters from the gas works into the river, because of the danger to the fish. We put in a separator something on the principle of the one described here, with about the same results; the water came out perfectly clean. As I was not in the room during the whole discussion, I hope you will excuse me for not saying more now.

Mr. J. R. Lynn—I would say, in reply to Mr. Miller, that when the remark was made that I doubted the ability of any one to separate the tar down to within 1 per cent. at the temperature quoted, that he surmised correctly. It has been the experience, even in coal tar that you can separate it, and you can separate any other tar so far as partial separation goes. You cannot drive off all the water contained in any tar, unless you get your temperature above 212°. It may be that by letting the tar stand out in your yard in a barrel for two or three years, that an analysis would not give you less than 1 per cent.; but unless it did rest for quite a while I think you would find very much smaller degree of separation.

Mr. A. S. Miller—This comes to the question between fact and theory. I suppose Mr. Lynn might say so much worse for the fact. The facts, nevertheless, are that tar is being separated every day.

Mr. Walbridge—The distillers made an analysis, and I think the most they claimed was 1¾ per cent. of any sample sent them.

Mr. J. R. Lynn—The President has called my attention to the fact that I had not answered Mr. Miller's inquiry in regard to the cost of those tanks. I would state that we purchased a second-hand tank; that is, the two were made from one. When they came to us they were combined in one, and it was taken apart, and a portion of the labor should really be included in the cost of the tank; part of that labor was expended in making 2 tanks out of one.

Mr. Douglas—I think the efficiency is in putting the boiler in suitable position to boil the water. We formerly burned crude oil to get results. You had a boiler setting up high?

Mr. J. R. Lynn—That boiler was not arranged for making accurate tests of the calorific value of this oil; but the figure I gave was merely an estimate, showing the amount of oil which had been displaced. Of course, a good many things might enter into the result. The quality of coal and the amount of work done with machinery around the gas plant, much of which is not run continuously, and quite a number of other little things as well, might be taken into consideration, which probably Mr. Miller did not think of at the time. I did not expect anybody to take that as literally correct, because I would not myself take any figures in regard to calorific value as perfectly correct, unless made under a boiler specially adapted to making the test.

The President—Mr. Thwing, have you not had some experience in this line? We would be glad to hear from you.

Mr. Thwing—What little experience we have had at St. Louis was at Station A, where they have rigged up a vertical tank and put in exhaust steam; that is, put in pipes from the exhausts of the engines. They succeeded in separating the water gas tar very satisfactorily, and I understand have got it down to between 1 and 2 per cent. The product is now sold to a tar-distilling firm in St. Louis at a reasonable figure. The exact method of doing it I am not familiar with, but it takes some time and is quite simple. They have small pipes in the tank—it is a very high tank—and they allow the tar to remain there for some time while heating it.

Mr. Finnegan—We had two wells there. We put two partitions in these wells within 30 inches of the bottom and cut off all the water coming from the seals. The water runs direct to the sewer. We ran all this condensation and that from the drips on the water gas line to these wells. An old tar scrubber that we had was connected with an 8-inch inlet, several tees and elbows inside, to divide it as nearly equal as possible. We ran 16 2-inch pipes into the header. The scrubber was 125 feet high, set on a foundation 5 feet high. We found when we pumped the tar from the bottom of the wells that it contained considerable water. When we filled the separator we turned on the exhaust and heated the tar to about 190°, and kept it at that temperature for four or five days and then ran the water off at the top. The tank holds about 7,000 gallons. It is a square tank, about 6 feet in diameter. We get about 20 per cent. of oil and 2 per cent of water. A disinterested party who tested a sample of it got 17 per cent. oil and 1½ per cent. water.

The President—Mr. Watt, we would be glad to hear from you.

Mr. Watt—I have never used a separator for oil tar except in an experimental way. However, I think the results largely depend on local conditions, heats, etc. I agree with Mr. Miller in reference to the size of the partitions of the separator. The lowest percentage of water I found in any sample of oil of tar that I have tested was 7 per cent.

Mr. Thompson—Do not Mr. Watt's remarks imply that he had reference to distillation and not to separation of tar? I think his remarks apply to that and may be taken as an indication, as in Mr. Walbridge's case and Mr. Finnegan's, that the distillation took all the water except 1½ or 2 per cent. We may probably admit that the percentage of water does not exceed these figures.

Mr. Walbridge—Just one word about that 1¾ per cent. Various samples we sent from our works to the distillers. The most they found in any sample was 1¾ per cent. One per cent was all that was reported several times.

Mr. Watt—I had reference to different samples of the oil which I tested.

Mr. Thwing—I would like to ask how Mr. Walbridge gets his water from the condensers to the scrubbers. Are the condensers higher than the scrubbers, or does he pump it from the condensers to the scrubbers?

Mr. Walbridge—We have a closed condenser, the last apparatus that the water passes through; then there is a condenser, open on the top, and it overflows from that to the scrubber.

On motion of Mr. Dunbar a vote of thanks was extended to Mr. Lynn for his paper.

LETTERS OF REGRET AND A TELEGRAM.

The Secretary read a number of letters regretting the inability of the writers to be present at the meeting and forwarding their wishes for a most successful meeting. On motion of Mr. A. S. Miller the following telegram was sent to Mr. Irvin Butterworth, whom the Association had been informed had been obliged to visit the Pacific Coast in the hope of bettering his physical condition:

"Association sends best wishes for speedy recovery, and regrets your inability to attend meeting. J. W. DUNBAR, Sec'y."

The President then introduced Mr. Frederick Egner, of Norfolk, Va., who read the following paper on

A STUDY OF INCLINED RETORTS IN EUROPE.

The value of the method now in successful operation for a number of years in various cities of England and Continental Europe to charge and discharge gas retorts by making use of the natural tendency of bodies to fall or slide when placed at an angle greater than that ensuring stability, must be apparent to every gas manager. Having had some experience with the subject—the unfavorable results of which were touched upon in my Presidential Address at our Louisville meeting—and having read a paper on "Inclined Retorts up to Date" at the St. Louis meeting of the American Gas Light Association—which I dare say you all have seen—I now place before you my observations on the same subject, gathered on a recent trip through England, France, Germany and Austria, and made solely with the object of studying the "inclined" or "sloping" retorts where used.

Let us begin at Rheims, where directed by the genius of Monsieur Andre Coze the "slopes" were revived, and for the first time constructed in a manner, making them a practical possibility. They have two benches with nine D shaped retorts each, heated by gas furnaces on the regenerator principle, and of the Hasse-Didier type.

They charge from 352 to 374 lbs. of coal per retort every four hours; and the charges were seen to be evenly distributed throughout the retorts, and well carbonized; which statement applies also, to every installation of the slopers seen, without exception. One of these benches had been in continuous operation for over 1,800 days, and the other more than 1,000 days, and seemed to be still good.

The gas works are owned by a private corporation, but it is expected that the city authorities will acquire the plant in a few years, and hence the company is not inclined to spend any more money on the works than may be necessary to keep them going. That explains *why* no more benches with sloping retorts have been erected at Rheims. Monsieur Coze explained, that if he were to build again, he would not construct his benches as these are constructed, but include improvements as applied elsewhere at this time. They still use the heavy, long-bent charging mouthpieces at the upper and back end of the retorts; which is one of the features Monsieur Coze would not now recommend. If one saw only the Rheims benches, one would scarcely prefer the slopers to horizontal retorts with good stoking machinery; as for instance the Ross stoker at the Cincinnati gas works. I am specially indebted to Monsieur Coze and his assistant, Monsieur Charles Augly, for kind attention while at Rheims. At the Municipal Gas Works in the Miller Strasse, Berlin, the slopers have been in operation for a number of years—experimentally, as Herr Bau-Director Reiss said—but, continued the same gentleman, our experiments have been so far satisfactory that we are now about to construct 10 benches of slopers at the Miller Strasse and 20 at the Schmarndorf works. There were 6 benches with 9 retorts each, in action. The retorts were about 10 feet long on the slope; heated with gas furnaces, consuming 16 per cent. of fuel per 100 lbs. coal carbonized; and coked 418 lbs. of coal per retort every four hours. The charging apparatus was most simple, yet complicated in a sense. It consisted of as many short scoops as there were retorts to be charged each hour. These scoops were suspended by means of rods and wheels, from a rail track, one side of which passed the charging mouthpieces, and the other side led back to the coaling platform where the scoops were filled before a charge was made.

The raising of the coal had been done in an equally simple way: There was an elevator platform on one side, and a water tank on the other; connected over suitable pulleys by a rope. When the coal car was to be raised, water was turned into the tank until its greater weight raised the car and the lowering was accomplished by running the water off, out of the tank. Herr Reiss said that this was done to save money during the experimental stage; but that suitable coal conveying machinery would be applied to their new apparatus. He also kindly gave me an order to Herr Carl Evers, Superintendent of works; to show me the drawings and works; and to the latter I am also much indebted for a number of practical hints concerning the results of their experimental investigations.

At the Gitschiner Strasse works, of the Imperial Continental Gas Association (a London corporation), I was most cordially received and hospitably treated by Mr. Edward Drory, the Chief Manager at Berlin, of above company's several works at Berlin. Mr. Drory had been for many years located at Vienna (in the same company's service), where he had, through many years of study brought the slopers to a high state of efficiency. At the time of my visit, Mr. Drory was erecting 26 benches of slopers with nine 15-feet long retorts per bench, on his improved Vienna model for which he insisted, in its present perfected state, he was largely indebted to his former assistant's (Herr Kœrting's) studies, labor and inventive spirit. These benches *must be* ready by October next.

Mr. Drory not only showed me all the drawings relating to this new work, but also his estimates of cost, from which it appeared that per 1,000 cubic feet of gas made, the slopers cost less to build than horizontal retorts. And as to cost of manipulation, the stoking machines—of which he had a number in operation at the time—although far more economical than all manual labor, could not compare by many per cent. with the slopers. And it must not be forgotten that Mr. Drory's experience with the three kinds of retort house manipulation, extends over a period of many years and is not a thing of recent occurrence merely. For the cost of the three systems as given by Mr. Drory, I would refer you to the published statements as per my paper—previously mentioned—of October last. Leaving Berlin, Dresden was visited next, and there through the kindness of Herr Baurath Hasse, the Neustader gas works were visited in company with the superintendent of works, Herr Hœffner. I saw there benches of nines which had been over 1,000 days in constant operation, but now let down for renewal; while other sets of benches had been—and still were—in operation, for over 800 days. Much information was obtained at Dresden, and then Vienna was visited. The English company's franchise, at Vienna, expires in four years more, and the municipality refused to renew it, and decided to erect works of their own. A similar state of affairs prevails, as mentioned concerning Rheims; with this difference only that the slopers, though from 700 to 800 days in operation, are up to date, and still good.

But to show how the slopers are regarded at Vienna, the fact that at the new municipal gas works, only slopers are to be used and no horizontal retorts at all, speaks volumes. Herr Hermann, the city's Engineer and Director in charge of the new Bureau of Gas, accorded me a most cordial reception.

He kindly exhibited and explained the drawings for the new plant, and presented the writer with a large copy of the ground plan, and a paper containing nine fine copies of drawings of the works. He stated that he had carefully studied the subject of manual and machine stoking, and gave at some length his reasons for having decided upon using slopers only. There will be 180 benches with nine retorts, 15 feet long, in each.

The ideal works, as a whole, was seen at Cassel. It was erected in 1894 in accordance with plans prepared by Mr. Emil Merz, the Engineer and Director of the Municipal Gas Bureau of the city named. Herr Merz had the good fortune to have an entirely new works to plan, and to execute his own designs. He was given all the ground space he wanted; and was not limited in any other particular. He was not obliged to convince a president—who was not a gas engineer, and perhaps knew nothing of the professional aspects of the business—that his, the gas engineer's plans, were really those which ought to be followed. It was understood that he was master of his art; and was trusted to do the best he could, and the result is what may be considered a model gas works. There is no odor of gas perceptible at any part of the works, not even in the purifying house unless a box is open; and everything is as safe and conveniently arranged as can be desired. Herr Merz presented me with copies of his reports, and I secured an order for 18 photographs of these works which, if received in time, shall be exhibited at this meeting. I would be glad to give you a full description of the works, but possibly it would take too much of

your time upon this occasion, and I will only say, that no horizontal retorts are used at those works. And that, in the building of those works from first to last, but nine months of time were consumed. Herr Merz describes the inclined retort as the "rational drawing and charging machine, without the aid of machinery." In like manner I saw the slopers in use at Huddersfield, Brentford and Salford in England, and can safely state, that it is my opinion that no one who had seen the "slopers" at work as I have seen them, would ever seriously consider the use of horizontal retorts if obliged to rebuild his benches. As stated at the beginning of this paper, in every case the heats were good; the coal well distributed and coked, and I might say of "slopers" what a Kentucky colonel is reported as having said about whiskey. "It is all good; only some is better and some best." So with the slopers. They differ mainly in the arrangements for handling coal and charging the retorts.

With some of the methods in use, there is absolutely nothing left to the discretion of the laborer who handles the apparatus, and with others more or less—but in no case much—skill on part of the workman, can affect the results. While on the Continent, retorts 10 to 15 feet in length are used mostly, in England retorts 20 feet long are more commonly used.

I would like very much to state some of the economical results obtained by this exceedingly simple method of manufacturing coal gas, but writing this paper in a London hotel, trying to get it off to the Secretary in time for our annual meeting, and not forgetting to try hard to get there myself, I may well be excused if such statements are postponed for the present. I shall, however, gladly reply to any inquiries concerning the subject, which anyone interested in the management of a gas company or companies, may desire to ask me.

[At the close of the reading Mr. Egner gave some figures in memorandum of the results secured at Vienna, Austria, and at Salford and Brentford, England. He also exhibited several photographs of the inclined retort systems at the places named.]

Discussion.

The President—Gentlemen, you have heard Mr. Egner's paper on a matter in which you are all interested, in that Mr. Egner proposes to demonstrate here something that has been demonstrated, a good thing in the old world. We would like to hear from Mr. Harbison.

Mr. Harbison—As I am not an expert on inclined retorts I do not feel competent to give any information. Our thanks are due to Mr. Egner for again bringing this matter to our attention. It is very possible that there is a great deal in it. My experience with retorts has been with ordinary settings, using generally the regenerative system of firing. I have not thought it desirable to make any changes. Of course, we have at Hartford a good water gas apparatus in connection with our coal benches.

Mr. Beal—I would like to ask where they get the best results with inclined retorts, in yield per bench and per man in twenty-four hours.

Mr. Egner—I would say that two works I visited (Brentford and Salford, England) show equally good results. They all do well everywhere. They seem to be doing about as well in one place as in another, in the instance of labor employed and as to weight of coal carbonized. If I might make any distinction I should say Salford was the best. At Brentford also nothing was left to the men.

Mr. Beal—I would like to get an expression of the value of the make per man.

Mr. Egner—I tried to work out my notes on the way over. I arrived here Saturday morning. There was a very nice library on the steamer, but I was not able to get my notes together into presentable shape, and I tried it also on the train coming here without success. Let me give you a few figures. At Brentford they have one man to 4 benches on the discharging floor—4 benches of 6's and 7's—one man to 16 benches on the charging floor, and a boy to quench the coke and wheel away slack. That is all the labor to 16 benches. It makes no difference whether they are 6's or 7's; they handle them just the same.

Mr. Beal—How many men to 100 retorts?

Mr. Egner—There were 96 retorts. Five men do the charging and discharging and attend to the furnace. A boy helps them.

Mr. Thompson—I understood that Mr. Egner visited Huddersfield. I want to know if he visited the plant at Middlesborough, which Mr. David Terrace erected on the inclined retort system some years ago. It is my recollection that some novel features in discharging were adopted at the Middlesborough installation. I want to ask a question about the retorts erected in this country. Those that have come to my notice have been constructed with discharging mouthpieces brought to a uniform level. That, in our case at St. Louis, we found a mistake. I believe those are now built with shorter mouthpieces at the upper end. I want to ask if that is the practice in all the German and English installations?

Mr. Egner—In reference to Mr. Thompson's question I would say I did not visit the works he mentions. I visited in England the plants at Brentford, Salford and Huddersfield. I heard of others working well; but as they were too far away I could not go. The examples which I give are representative works of the sloper type only. The discharging mouthpieces, as Mr. Thompson surmises, are just flat plates with lids close to the mouthpiece of the retort to reduce the radiation of heat from the setting as much as possible.

Mr. Thompson—I infer that the upper mouthpieces are bolted to the retorts.

Mr. Egner—The upper mouthpieces are bolted to the retort, the same as we bolt all our mouthpieces at present.

Mr. Beal—Can you give us the make per mouthpiece, where they have these retorts?

Mr. Egner—I cannot give you the make per mouthpiece, but they charge about 700 pounds of coal every 6 hours at the Brentford works.

The President—The yield is about what?

Mr. Egner—Something like 4½ feet; it varies.

Mr. Beal—That is 14,000 feet a day.

Mr. Walbridge—Do I understand that to the 96 retorts, 5 men and a boy were employed in charging and discharging?

Mr. Egner—In charging and discharging, I think 4 men; one man and a boy attending to the fires. So 5 men and a boy do all the work, except the bringing in of the coal.

Mr. Walbridge—Did they take away the coke and bring in the coal, or just simply charge the coal as it was there at hand, and discharge into wagons ready to be taken away?

Mr. Egner—The coal was brought in, the coke was loaded in wagons and hauled out, and what dropped off from these wagons was taken out by the boy. They had piles of coal laying in the yard.

Mr. Walbridge—Did it require 5 men and a boy solely to charge the coal and discharge the coke for 16 benches?

Mr. Egner—That is right.

Mr. Bredel—Mr. Egner, I understood that there were 4 men for discharging and one man for charging, and one man and a boy to attend to the furnace. That would make 6 men and a boy, and not 5.

Mr. Egner—That is not right. Only one man, as I said, to 4 benches on the discharging floor, and one man to 16 benches on the charging floor, and one boy to help them.

Mr. W. N. Miller—Mr. Egner says one of these benches had been in continuous operation for 1,000 days, and the other for 1,800 days. I would like to ask the life of a horizontal retort?

Mr. Egner—I should be well pleased in my experience, if the retorts did their duty and we had good heats, if they lasted 700 days. I think they would then owe the company nothing.

Mr. W. N. Miller—I referred to the retorts you saw at Rheims; not those here. I know about their life.

Mr. Egner—That I could not answer. I have no information on that subject; but the sloping retorts I inquired about particularly.

Mr. Bredel—Where were these retorts made?

Mr. Egner—I could not answer that question.

Mr. Bredel—In France?

Mr. Egner—The Rheims retorts?

Mr. Bredel—Yes.

Mr. Egner—Made in France.

Mr. Beal—I wish you would inform me on the following, which will probably bring out what I want: 2,800 cwt. of coal a day to a retort yields 14,000 feet of gas per retort, or 84,000 per day per bench, and 16 benches equal 1,344,000 feet. Is that correct?

Mr. Egner—I have not figured it up.

Mr. Beal—84,000 a day for a bench of 6 retorts. That, of course, gives a fair measure of the value of this system from that standpoint.

Mr. Egner—They have frequently made more than 20,000 feet per retort in Vienna; they have averaged there 20,000 feet per retort per day.

Mr. Beal—That is 20,000 to a bench?

Mr. Egner—Yes; and they were all 9's.

Mr. Beal—How long?

Mr. Egner—15 feet.

Mr. Jenkins—Have much trouble in regard to carbon?

Mr. Egner—It was said to me they had very little trouble with carbon. In opening the retorts the rush of air burned it off to some extent when they were charging. Perhaps once a month they would leave a retort open for about 20 minutes, and the air would loosen the carbon and it could be taken off.

Mr. Jenkins—A good deal less than a horizontal retort?

Mr. Egner—Yes.

Mr. Moss—In 1893 I was connected with the Burnley works in Lancashire, England. We adopted the inclined retorts. They were 20 feet through, nine in a bench, on the regenerative plan. In the first setting of 4 benches of 9's erected we took off our gas at the lower end of the retort. The retorts were at an angle of 32°. We had considerable difficulty with choked pipes. We undoubtedly lost some illuminating power. In the next benches that we erected we took off our gas at the upper end, and after some few changes, had no trouble whatever. We carbonized 7 cwt. per retort every 4 hours. The illuminating power remained the same as it did with stoking machinery, which was being worked in another retort house. We could make more gas in less space. No skilled labor was required. A laborer brought from the yard and put into the retort house could charge the retorts as conveniently as a man who spent months in working with machinery in the horizontal retorts. I made several hundred tests whilst I was there, and found that keeping on the same gang of men from the time the retort was opened to the time it was closed again, only 25 seconds elapsed. I do not think you could possibly beat that with stoking machinery. The retorts were not open so long, we got less air, and we got, for the ground space, considerably more gas. I just want to give you a mental picture, if I can possibly do so, of the works, starting from the beginning. You can imagine the railroad running alongside your works. You dump your coal down into your storage bin; it is crushed by the crushing machine, and is carried up to the hoppers by means of a conveyer. There are large-sized bins above the retorts that will hold pretty near half a day's supply of coal. There is a hopper that measures out the charge of coal and no more, and when the hopper is opened to allow the coal from the large bin to drop into the measuring hopper, it cannot hold more than a certain amount. By pulling the lever you close off the top bin and open the lower one, carrying the coal into the retort, regulating the velocity by means of a brake on the shoe that enters the retort. Thus you do not have it dumping down into the lower end of the mouthpiece, but get a regulated amount of coal almost as even as if done by machinery. I am not here to champion the cause. I want to tell you of practical results, and the most important part about it is, as far as I can see, that it will cheapen labor, make us more independent of skilled labor, and will enable us, in times when there may be a tendency to strike, to bring in men that, though not qualified by having served their time, can keep up the yield of gas just the same.

Mr. Jenkins—Can Mr. Moss give us some information as to the yield in 24 hours?

Mr. Moss—From 35,000 to 40,000 cubic feet per man, for 24 hours.

Mr. Egner—I am aware of the unsatisfactory replies I must have made to some of the questions. That I have travelled continuously for two months, I hope you will bear in mind. I have hardly had time to rest, and did not have time to correct my notes. I gave you all I could in the paper. I want to say that to any gentleman desiring information on the subject, that in about two weeks from this time I shall be better prepared to give it. You simply write me and I will give you all the information that I have on the subject.

Mr. Thompson—We all understand the influence of local conditions, and that circumstances alter cases. I do not understand, however, how Mr. Moss was able in the Lancashire works to entirely free himself from the difficulties of stopped stand-pipes by transferring the point of take-off to the upper end of the retort. Our installation in St. Louis consisted of 8 benches of 7's. The take-offs were at the upper end of the retort. The benches were built back to back, and instead of a dip into the hydraulic main the stand-pipe was brought up through the main and surmounted by a pipe of larger diameter which formed the dip. From the outset we had difficulty on account of pitch stoppages in the main. The mains were taken down and cleaned, and were found filled solidly with pitch. The stand-pipes themselves, as short as they were, soon pitched up, and the only time we had any success with them was when we changed and put them on the bottom,—precisely the reverse of Mr. Moss's experience. I wanted to know if he had any difficulty with pitch in his main. He says he overcame the difficulty of stopped stand-pipes by transferring the point of take-off from the lower to the upper end. Was the main affected? I might add that our difficulty arose to some degree from the fact that the benches, being built back to back, and the hydraulic main being close to the brick work of both stacks, was subjected to a very much greater heat than in the case of the Lancashire plant.

Mr. Moss—I think Mr. Thompson has partly answered himself, inasmuch as he states that the retorts were set back to back, with a short take-off. Consequently, that being the case, if Mr. Thompson had at any time taken the temperature of the hydraulic main I think he would have found it at a very high degree. We did not, by-the-way, have very much difficulty when we took off our gas at the lower end, from the fact, in my opinion, that benzole and like hydrocarbons being continually passed out, kept the pitch in solution, but at the same time, in doing so, I think we lost in illuminating power, and through a gradual acccumulation of this pitch we were finally troubled with stopped pipes. After changing to the upper end we used larger pipes (8-inch) than is general, and I think that is the reason we did not have any further trouble with stopped pipes.

Mr. Egner—Mr. Thompson has stated the case quite correctly as to our experience in the St. Louis works. I would not advise any one to place the take-off pipes at the upper rear end of the retorts.

Mr. Bredel—I think the reason for the stoppage in the pipes as named by Mr. Egner is not sound. It might be that the stand-pipe going through the liquor was suddenly chilled in the hydraulic.

Mr. Egner—Another thing. We would naturally suppose that in a retort standing on the slope there would be a considerable accumulation of tar in the mouthpiece. Such was not the case.

Mr. Moss—When we took off the gas at the lower end of the retort, we had a considerable amount of tar constantly dropping from the mouthpiece. and to my mind, if the question is viewed from a scientific standpoint, with all due respect to my friend, it is scientifically correct to take off the gas at the upper end. Referring to a former speaker's remarks about chilling, we certainly can chill it off too suddenly and produce a solid, or we can heat it up too much and drive off the solution. The practical point is to get the happy medium.

On motion of Mr. Walbridge the thanks of the Association were extended to Mr. Egner for his paper.

The President then called upon Mr. Geo. Treadway Thompson, of New York, for an account of the

WRINKLE DEPARTMENT,

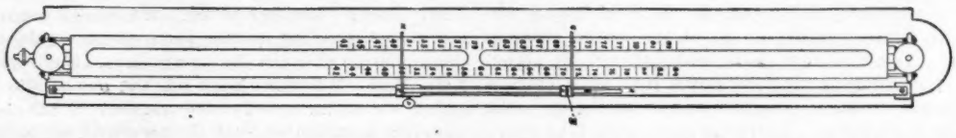
which Editor Thompson presented as follows:

Sketching Cracks in Retorts.—Is ingenuity less rife than formerly in the direction of accessories in coal gas generation, or have those "skilled in the art" covered all its details? We may safely agree that neither of these questions may be answered affirmatively, nor do we admit that coal gas is of less relative importance than formerly; yet the fact remains that as reflected in this department of our Western Gas Association, in interest and ingenuity, it has given place of late to its sister process. In coal gas making, the only suggestion which comes to us this year is that of keeping track of the condition of retorts by means of isometric sketches. A skeleton view is drawn showing in isometric projection all the retorts in a bench; a convenient size is that employing a sheet of regular business letter paper; duplicates are then made, two for each bench, by hektograph, mimeograph, or similar process. The record need only be taken after a retort is scurfed, as all cracks are then plainly visible, and their position and nature (whether narrow or very wide) may be indicated on one of the bench-sheets with considerable accuracy. The lines are later redrawn in ink on the other sheet for the bench, which is thus kept clean and forms the permanent record, on which are noted the date of resetting retorts and the dates of appearance of serious cracks. The benches are numbered from left to right, and the retorts in each bench are numbered alike.

Coke Elevator for Generators.—In natural order, the first of the water gas devices which we have is that on handling coke to a generator, communicated by Mr. Ralph Woodward, of New

Rochelle, N. Y. He writes that in putting in a new water gas set for his company, they raised their operating floor about 6 feet, which made too steep an ascent for the men to wheel the coke up an inclined way, as formerly. Having insufficient space for a platform elevator, a link-belt bucket conveyer was installed *outside* the building, operated by a small engine placed on the charging floor; a boot was sunk a little below the ground level, and a simple housing erected to protect these outside attachments. The coke is hauled in wagons to the works and unloaded into the boot; the conveyer raises and discharges it into a large hopper within the building, just beneath the roof. From this it is fed directly to the generator by a long chute, open at top, and hinged to the mouth of the hopper, at which point is a gate and lever under control of the gas-maker, who thus requires no assistance on the operating floor. The swinging end of this chute is counterbalanced by a weight with cord over a pulley, and is swung up out of the way when not in use.

Indicator for Oil Gauges—A contributor who wishes his identity concealed sends the convenient wrinkle which is illustrated in the accompanying cut; he entitles it "the water gas tarrier's ready reckoner," for by its aid the quantity of oil to be fed during each run is shown by resetting for any part of the scale, after once being adjusted. A is a ½-inch square iron rod attached to the scale board by screws at the ends, the screws passing through small blocks which hold the rod away from the board. C is a brass collar sliding on rod A; soldered to this collar is the ¼-inch square rod B and the wire pointer H. Upon this smaller rod B slides a collar E, to which is soldered another pointer G. The set-screw or thumb-screw F is used to fasten the collar E at such a point on the small rod B that the distance on the oil gauge between the two pointers denotes the number of gallons to be used per run. After



each run the screw D is loosened and the contrivance slipped down the rod A until the upper pointer is again at the surface of oil in the gauge glass. (See cut.)

Sight-box on Oil Overflow—Where the arrangement of oil supply to the feed pumps includes the use of an elevated tank, it is usual to provide an overflow pipe to take care of the surplus if at any time the supply pump delivers oil at a greater rate than that at which it is withdrawn from the upper tank; indeed, in some cases the supply pump is kept in operation continuously, and a practically constant overflow intended. In either instance, it is well to have some means of seeing the overflow, and the best method of accomplishing this which has come to our attention is by inserting in the vertical line of overflow return, and at a height from the floor sufficient to bring it level with the eyes, a cross whose side outlets are glazed. For a 1½-inch overflow a 1½-inch by 2-inch cross is a convenient size. The cross may need to be specially made with side outlets threaded outside instead of inside, and rings to engage with these threads, lipped to hold the glass. Leather washers insure tightness. This device is in use by the Milwaukee Gas Light Co., but its designer is not known.

Reflector at Gauge Board—A gas jet before the pressure gauge board near its base, and provided with a tin screen in front for the double purpose of reflecting light upon the gauges and of protecting the jet from drafts, is a convenience in night work, and is especially adapted to this use where the gauge board is attached to the side of the superheater, as is the frequent practice at present.

The rose may be pardoned for wishing to blush unseen if after all, its sweetness is not wasted, so we may accept with thanks another communication whose sender would remain incognito. The editor would state that in all items which have been published good faith has been preserved by his being informed of the contributors' name, but in these instances compliance with the stereotyped journalistic provision "not for publication" has been requested. The "Well Wisher" who has sent some important notes for previous budgets now forwards the two which follow:

Protecting seat of Hot Valve—The "hot valve" as furnished with the reversed steam connection to some generators has a vertical water cooled seat.

"The writer has found that this seat invariably cracks after several weeks' use. The water cooling feature has to be then abandoned and the valve used in its cracked condition until a new valve body is substituted. If the valve were 6 inches larger than the take-off the seat would be in a recess of 3 inches and so protected from the impact of the flames from generator during blasting. As an alternative to purchasing such a valve, I lay a ring of soap brick inside the take-off pipe lining and just in front of the valve seat, thus protecting it.

"The contraction of the take-off thus brought about has no noticeable effect on the capacity of the pipe. After a very frequent purchase of valves, I note that the last one bought is still as good as new after six months' use, and that the circulation of cooling water through the seat is still uninterrupted."

Cooling off Carbureter and Superheater—"Where time is an object it has been found that the quickest and easiest way to cool off the carbureter or superheater of a water gas set preparatory to removing the checker brick for renewal, is to take out the oil spray fixture from the carbureter and introduce through the opening a piece of ½-inch pipe, to which a hose for water supply has been connected. In the case of the superheater, introduce water through stack valve opening and afterwards at the various side manholes from top down as required."

"Time required to cool off carbureter, one hour; superheater, three hours. It does not pay to draw out red hot bricks; the cooling loosens them up, and much time is thus saved. The water does not reach the walls to injure the linings."

"Of course, the water jet must be in the hands of a competent man who will move it constantly and who will not put on more than is required."

Screen on Blower Inlet—The attachment of a semi-spherical screen of wire netting (say ½-inch mesh) to the outer bearing of a blower is a convenient precaution against the danger of drawing in of hats, waste, etc., by the suction of the machine, to the loss of these articles and possible injury to the blower or blast gates. The "basket" of netting is hinged below and provided with a clamp and staple at top. We understand it to be the device of Mr. A. B. Slater, Jr., of Providence, R. I.

Cinder-tray in Purifiers—A foreign correspondent states that he employs in his purifiers a lower tray on which is placed a layer of about 3 inches of pea-size cinders, covered by some 3 inches more of very fine cinders, to arrest tar. He is operating a water gas works, and acknowledges that tar should not reach the purifiers, but adds that "It does, just the same," and that this material is superior to sawdust. By placing the two sizes of cinder as stated, excessive back pressure is avoided, and the tar and oily matters are wholly removed.

Reviving Oxide in the Off Box—In a paper on Iron Oxide before the American Gas Light Association in 1893, a description was given of a mode of reviving in the off box by injecting air with a steam jet through the inlet elbow of the box, regulation of quantity being made by an adjustable part in a temporary cover over the outlet well. Description of an improved method now comes to us, which consists in placing a steam jet exhauster on top of the center seal, connected to the "off" division, and provided with a rubber steam connection, and a union between the horizontal jet and the cap of center-seal, so that the discharge pipe can be kept always pointing in the same direction. Instead of employing a foul-air pipe from each box, a single line is installed. When a box of oxide is to be revived, the cover is raised and the outlet well plugged, then by starting the exhauster, air is drawn downward through the oxide and discharged through the center-seal cap at "off" division, to the foul-air pipe. A cock below the union on the exhauster connection prevents the escape of gas through the air pipe when turning the center seal cap in changing, and the union is loosened to permit the jet to swing freely at the same time. (See cut p. 865.)

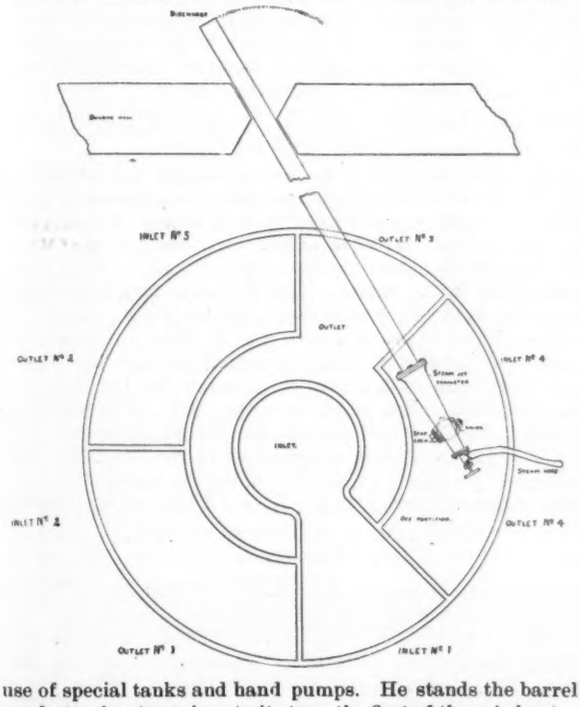
Designating Piping by Colors—In certain works, the valuable practice is followed of painting in different colors the several systems of small pipes about the plant. Thus the gas supply and pressure gauge connections might be blue, the oil pipes green, ammonia lines yellow, tar pipes black, steam pipes red, water pipes white, etc., with several colors to spare for additional systems, or

for sub-division of any of those mentioned. It is no exaggeration to say that there are many works each possessing more than a mile of small pipe in sight in their buildings and cellars, and often those of four or five systems of similar size run close together through some of the rooms. The advantage of tracing at a glance the pipes for each purpose will be immediately recognized, and this method seems preferable to that of tagging each pipe with a memorandum of its object.

Introducing Steam to Holder Tanks—Mr. W. M. Eaton of Jackson, Mich., forwards an account of an improved method of introducing steam into the tank of a gas holder. He provides a truncated cone of galvanized iron about 30 inches long, 12 inches in diameter at the base, and 4 inches at top,—open at both ends. This is suspended horizontally in the water of the holder tank by wires through two rings attached to the outside of this funnel, the small end being just below the water's edge, the large end submerged about two-thirds. The steam pipe is brought down beneath the water, enters the large end of the cone at the line of its axis, and discharges horizontally toward the small end, the steam nozzle being about midway the length of the cone. Mr. Eaton adds that the operation of this device has kept his holder free from ice with less steam than by any other method previously used.

The Editor has seen the same principle applied by the use of a 3-inch reduced tee enclosing the steam jet, but this is less effective than the foregoing design.

Using Oil from Barrels—Mr. Eaton also communicates a description of his arrangement for storing alcohol in barrels for current use in thawing out services, etc., to prevent the loss which he has experienced through the faucet not always being fully turned off; and this method is applicable to lubricating oils as well, avoiding



the use of special tanks and hand pumps. He stands the barrel on end, and attaches two pipes to its top; the first of these is bent over at the top with its end turning downward, and its other end passes through the barrel head and terminates close to the bottom. The second pipe simply passes through the barrel head; and each pipe is provided with a cock. A gas fitter's proving pump is attached to the second pipe and air pressure is raised; cans may then be filled from the faucet formed by the bent end of the first pipe by opening the cock. Care should be taken not to have an excessive pressure, and in the case of alcohol, if any remains in the barrel at the end of winter, the pressure is released through the shorter pipe.

New Form of Main Pipe Map—From Mr. B. E. Chollar of St. Louis, comes the suggestion of using a supplementary map of street mains, drawn upon tracing cloth without the block divisions to interfere with its outlines, and indicating the sizes of main by wide or narrow lines. The Editor does not understand that this is intended to do away with the customary record map, but that by laying the cloth upon the map and tracing the pipes with the widths of line indicated below, the system as a whole and its possible weak points may be more readily comprehended. The widths of lines are as follows:

3-inch	main,	1-10	millimeter	wide,
4-inch	"	2-10	"	"
6-inch	"	4-10	"	"
8-inch	"	7-10	"	"
10-inch	"	1	"	"
12-inch	"	1½	"	"
16-inch	"	2½	"	"
20-inch	"	4	"	"
24-inch	"	6	"	"

The proportions of these widths correspond closely with the relative areas of the pipe sections.

The tracing cloth when these lines are drawn may be conveniently used by itself, or placed over the map.

Temporary Street Valves—The importance of periodical tests of main pipe is recognized by every gas manager, but its most satisfactory accomplishment by isolating blocks or streets with a valve system is possible to very few. Mr. J. M. Rusby of Jersey City, informs us of his use of bags in lieu of valves, and success with this convenient substitute should result most advantageously. He employs the method on mains up to 10 inches in diameter, by drilling and tapping a 2-inch hole in the main at the point to be shut off, and introducing *two* bags into the pipe, inflating them equally, and making them take positions on either side of the bag hole. He then screws a 2-inch nipple some 3 or 4 inches long, into the hole, and draws the tubes of the bags up through it; water is then poured into this nipple and fills up between the bags to supplement their own tightness.

By keeping the water filled up into the nipple a slight "head" is maintained, and a most satisfactory degree of tightness secured. This is but a modification of the method of tightening a double gate valve which may leak slightly, by filling between the gates with water. If the main on which the bags are used contains deposits of naphthaline, a wise precaution is to wash it out by injecting naphtha or wood alcohol through the bag hole, followed by a thorough washing with warm water. But should the main be part of a long stretch through which a considerable quantity of condensation is passing, the bags could not be used, and in their stead, Mr. Rusby employs a mixture of two parts of fire clay and one part of cement, mixed and moistened, then passed through the bag hole, completely blocking off the pipe. The excess of fire clay prevents the mixture from setting before the test can be completed, and it may be removed by an iron spoon.

In the case of small mains, the 2-inch hole weakens the pipe, and to avoid danger from this cause, Mr. Rusby covers the opening with a split sleeve instead of plugging it when the test is completed. The location of the sleeve or plug is carefully measured and noted, and the same bag hole used for any subsequent tests.

Service Protection through Area-ways—Where a service pipe passes through an open area-way in entering a building, it is doubly exposed to deposits and freezing, and straw wrappings or boxing is often resorted to. Another method of minimizing the trouble is by making the line through this dangerous section of extra size, connected to the service proper and to the riser by reduced couplings eccentrically tapped and attached at the upper side of the circle, to permit the lower portion of the enlarged pipe to fill up while still leaving a gas-way at top. The Editor prefers to employ an inner tube in the enlarged section, open at each end and centered in the larger pipe by a "spider" or similar support, while the outer pipe extends well within the area and foundation walls at either end, for complete protection. This permits the annulus between the pipes to fill up completely with frost or ice, and such a deposit is an excellent insulation from the further effect of cold. One manager who has employed this method writes that a service which had previously required the daily application of alcohol, went through a severe winter after installing this device, without attention, and that his service foreman remarks, "Dat service do summer business all de time."

Similar Principle for Lamp Risers—The same principle may be applied on lamp risers by taking a ¼ inch pipe of the length of the riser, serrating or "saw-toothing" its lower end, and dropping it down the riser. The operation of the device is obvious.

Improved Meter Books.—The objections which often properly apply to the meter books of ordinary form, may be overcome by the

use of the system here described. Sheets are printed on heavy paper, with twelve coupons (one for each month) separated by perforations. The head of the sheet bears the name of the consumer and his address, with the number, size and make of the meter, and both head of sheet and each coupon is stamped with the number of the account in the folio of the individual ledger. The meter reader enters the register upon the coupon for the month of his visit. After the reading has been transferred to the ledger, the coupon is torn out and filed, and when the reader goes out the following month, he has no figures of previous readings to guide him, so can not average or estimate the readings, but must make a bona fide inspection of each meter. Simple binding covers are provided which provide for securing the sheets by cords or pins through holes in the heads of the sheet; additional meter sheets may thus be inserted in their proper order, or superfluous ones removed. This system has been in use for some years by the Milwaukee Gas Light Company, and is the plan of Mr. S. J. Glass, their secretary, who states that he knows of no other company in the country which has so low a record as theirs in errors in statement, taken in proportion to the number of meters read.

Supplementary Kitchen Boiler.—Mr. W. C. Clarke, of the Gilbert & Barker Company, New York, describes his device for employing a supplementary boiler in connection with the instantaneous or other form of water heater:

"It is to be observed that since a water heater necessarily only adds heat units to the water that is passed through it, the temperature at which the water is delivered to it is an important point. Since there is a place in every house where the temperature in winter is as high as 70°, if you hang up in such a place (possibly near the furnace or in the ceiling of the cellar) a common galvanized kitchen boiler (which may be bought for $6.00 or $8.00), letting the water pass into it from the street and thence to the heater, you will fully double the capacity of the latter. During the winter the water is delivered from the street at below 40°; in summer it will come to the heater at about 70°; if, therefore the water is held in such a receptacle as I have suggested, the results from the heater are approximately the same both summer and winter, and in addition to the increased capacity of the heater, a material saving of gas is attained in winter."

Correction on Bar Photometer Readings—Our ingenious "Well Wisher" sends one more evidence of his ingenuity and good wishes:

"Here is a table by which the bar photometer can be used for frequent and closely accurate observations of candle power, without any figuring.

"It is premised that an Edgerton standard is used, and also that the exhauster man, valve man, engineer, foreman, or other person making observations, can read and write and also subtract. The man reading the photometer adjusts height of flame on standard; the 'rate of burning' is taken care of by governors and their action is tested and adjusted daily by some competent person who also re-standardizes once every two months. The man reading the photometer then observes the barometer and thermometer; he may note, for instance, that the former is 30.3, the latter 76; looking at the table, he finds for these readings the figure 467, at the bottom of the table is marked "Take off 113;"—he thus knows that if the gas is at the required standard of 26 candle power, his bar reading should be 3.54. The value of the Edgerton standard is 7.10 for the time being. Now 3.54 x 7.10 equals 25.134, and correcting for barometer and temperature, we divide by .968, which gives 25.96 candle power.

Suppose barometer 29.8, temperature 64, tabular number 474. Take off 113 as before, leaves 3.61 desired bar reading: 3.61 x 7.10 equals 25.63, and correcting for barometer and temperature, we divide by .986, which gives 25.99. Whenever there is a change of value of standard, a new figure is put at top of table. For instance, if the changed value of the standard were 6.80, then we would determine the new amount to be subtracted and substitute it for the 113. It would then be "Take off 98." If we desired to make 25-candle power gas, we would merely change the subtraction number. The man looking after the candle power by an average of say three observations, extending over a minute, every half hour, takes note of only the bar reading and reports the candle power as being at any certain time "just right," "one tenth low," "half a tenth high," etc. For a standard value of 7.10 and a candle power of 26, every tenth on the bar represents about seven-tenths of a candle.

	29.5	29.6	29.7	29.8	29.9	30	30.1	30.2	30.3	30.4	30.5	30.6
90	444	445	446	447	448	449	450	451	452	454	455	457
88	446	448	449	450	451	452	453	454	455	457	458	459
86	448	450	451	452	453	454	455	456	457	459	460	461
84	450	452	453	454	455	456	457	459	460	461	462	463
82	452	454	455	456	457	458	459	460	461	463	464	465
80	454	456	457	458	459	460	461	462	463	465	466	468
78	456	458	459	460	461	462	463	464	465	467	468	470
76	458	460	461	462	463	464	465	466	467	469	470	472
74	460	462	463	464	465	466	467	468	469	471	472	474
72	462	464	365	466	467	468	469	470	471	473	474	476
70	464	466	467	468	469	470	471	472	474	475	476	478
68	466	468	469	470	471	472	473	474	476	477	478	480
66	468	470	471	472	473	474	475	476	478	479	480	482
64	470	472	473	474	475	476	477	478	480	481	482	484
62	472	474	575	476	477	478	479	480	482	483	484	486
60	474	476	477	478	479	480	481	482	484	485	486	488
58	476	478	479	480	481	482	483	484	486	487	488	490
56	478	480	481	482	483	484	485	486	487	488	490	492
54	480	482	483	484	485	486	487	488	489	490	492	494
52	482	484	485	486	487	488	489	490	492	494	495	496
50	484	486	487	488	489	490	491	492	494	496	497	498

Value of Edgerton standard
7.10
Candle power maintained
26.00

For correct bar reading for any temperature and pressure, subtract 113.

"The foregoing table is not presented as a model. It would not answer for all limits; for 16 to 20-candle power gas, or above 30, new tables would have to be prepared. It is constructed for 26-candle power gas for a standard somewhere near 7.00, and so far a normal bar reading of 3.71 at 30 inches and 60°."

"This is not the writer's idea; it has been in use by him for a number of years. The originator is not known."

Sampling Ammonia for Test—Having secured our sample of ammoniacal liquor for testing by distillation, the quantity to be introduced to the flask is usually removed by means of a pipette, the upper end of which is placed to the lips. Some of the ammonia gas is necessarily inhaled by this method, and leaves a very unpleasant taste in the mouth. This objection may be avoided by using in the bottle in which the larger sample is placed, a cork pierced with two holes. Through one of these, the small end of the pipette is introduced, and it is passed through the cork to a point near the bottom of the bottle. Through the other hole a small glass tube passes, entering the top of the bottle. By blowing down the latter tube, the liquor is driven into the pipette as required.

This is on precisely the same principle as the attachment for alcohol barrels described by Mr. Eaton, but its application for this purpose is the suggestion of Mr. Horace Slater, of the Milwaukee Gas Light Company.

Discussion.

The President, in inviting discussion, said that Editor Thompson was ready to answer any queries that might be expressed.

Mr. Egner—Had I been here in time I should have contributed to Editor Thompson's "Wrinkles" something I saw in the old country. Mr. Stelfox showed me the following: When you have a pipe and want to lay another pipe at right angles and on the same plane thereto, and you come right against that pipe, how are you going to get around it? He had a split sleeve, cast with a bell on each side of it, and so enlarged in the body as to permit of the gas passing the obstructing main. When he wanted to get around any main, he bolted the split sleeve on the pipe to be passed and made the ends secure, then connected the new pipe to the bells on each side of the sleeve and thus completed the connection. I hope you get the idea.

Mr. Thompson—Did Mr. Stelfox say whether he had any deposit from the gas on account of its impinging against the pipe?

Mr. Egner—He did not, but you might naturally expect that he would, and would remove it in the usual way.

Mr. Thompson—The "Wrinkle Department" has contained a few facts contributed by Mr. H. L. Doherty on a somewhat similar principle, although different in arrangement, by which he carried one pipe over and another under the main, the upper one serving as a conduit for the gas and the lower one for condensation.

Mr. A. S. Miller—I do not want to hear from foreign correspondents. I hardly think Mr. Thompson had the right to the question, as we live in the same city. I think that shavings are better under the box to catch the tar, because in the first place the other method is expensive, and it is of no use. I use shavings, and when I am through with them I burn them under the boilers. I think that in the accumulated tar I get back, as fuel under the boilers, the first cost of the shavings and the cost of putting them in the box. After what was said this morning, I would hardly care to refer to the next thing, which has reference to revivification in situ. It is well known that a center seal is not intended to stand very much heat; it is likely to heat the center seal to a very considerable extent if the hot gas is drawn through it. In this connection I suggest they use the same arrangement to blow through it. I cannot see why they cannot blow instead of drawing through the box.

Mr. J. R. Lynn—It would be rather inconvenient to connect a box so as to carry off the heated air, and there would certainly be some objection to allowing that heated air to escape into the purifying room.

Mr. Thompson—Do I understand Mr. Lynn to refer to the escape of the heated air from the top of the box where you blow up, or to the discharge from the outlet of the foul pipe as shown in the sketch?

Mr. J. R. Lynn—Where it is blown.

Mr. Thompson—I quite agree with Mr. Lynn on that point, and think that Mr. Miller, if he ever tried to run the gases up through the box, permitting them to escape into the purifying house, would hardly continue the practice. We have tried it, and it is extremely unpleasant. It may be rather ungracious to criticise the contribution of a correspondent who has acceded to my request for the contribution; but I agree with Mr. Miller that the center seal is no place for the heated air given off in the revivification of oxide. It is very much better to blow through if you must use the center seal, and better yet to install additional lines of foul-air main, as Mr. Lynn suggests. So far as the center seal is concerned, I have endeavored to sink my personality as a contributor in my position as editor, or I might have stated that my own preference was the use of breeze instead of shavings. The breeze, if it accumulates any tar, is better than the shavings as a fuel.

Mr. A. S. Miller—I have all the connections made to blow air through the boxes, and, as I stated this morning, I stopped that practice because we did not separate the tar from the gas. I am now making arrangements to scrub the gas; when I get them perfected I intend to use my apparatus to blow air through the boxes. As a matter of fact, we have no occasion to have anybody working on the upper floor when we are blowing through, and while a little odor is a pretty good, rich thing in a neighborhood, it smells just as bad whether you suck it down or blow it out. It is only a question of getting it out of the purifying house. So I ask for information, because I have all arrangements for blowing through, and it can be easily changed by putting an exhauster on my steam piping. I have the blower on it, and I do not see any particular reason to change. I should think it would be just as good.

Mr. Jenkins—Is there any advantage in blowing or taking it down? I am somewhat interested.

Mr. A. S. Miller—The tendency in sucking down would be to pack the oxide; the tendency of the blowing through would be to loosen it.

Mr. Jenkins—What length of time is required before the oxide begins to revivify? I think the point Mr. Miller makes about the loosening up is an advantage. Which is the better place to send the air, out of the top or the bottom?

Mr. Thompson—Does Mr. Miller drive his air through a box with sufficient speed to make any difference in the packing of the oxide?

Mr. A. S. Miller—I cannot say I do. I never sucked it down. Mr. Baxter says he packs his oxide 2 inches. The depth of oxide in the box is 2 inches less after revivifying, if I remember his paper read this morning.

Mr. J. R. Lynn—I think it would require an enormous air pressure if oxide were left in the box to any depth to keep it from packing. You have the depth and weight and have to overcome the resistance which that weight will give, and you have comparatively small openings through which to do it.

Mr. A. E. Forstall—I have no experience in revivifying oxide by either blowing or sucking through, but I have a dim idea that somewhere, three or four years ago, I saw a statement made that someone had tried to revivify by blowing through the box, and had had a great deal of trouble with his oxide heating right on the trays where the air first struck it, at a point at which he was entirely unable to quench the fire without taking his oxide out of the box. He then changed to the process of sucking down through the box, where, if the heating took place, it was apt to occur early in the proceedings on the top surface of the oxide, where he could very easily throw a stream of water on it and put out any fire that might break out. I think if you were sucking down through the box there would be a certain amount of revivification going on through the whole depth of the oxide, a great deal at the surface, gradually decreasing as you got to the lower tray, so that when the oxide was revivified on top there was no action on the air at that point. All the oxygen was then available for revivification at the bottom. There would not be the intense action taking place, due to the oxide being only partially revivified that would occur if you started to blow up against the foul oxide. There would be no damage by fire at the lowest layer of trays if you suck down through the box, while great damage might be done by blowing up through the box.

Mr. Thompson—I have revivified oxide in the box by blowing through it, for about 18 months, and have had no trouble from oxide firing in the box. But whether you revivify by drawing down through or by blowing up through, your most intense revivification naturally takes place on the surface of the oxide. You can see the brown color gradually going down through as the process of revivification progresses. I think in our case the blowing through occasioned no particular danger from fire, from the fact that we did not use a positive blast blower, nor a Sturtevant blower, but a steam jet, not to be recommended as the foremost by any means.

Mr. Walbridge—I would ask Mr. Thompson when using the steam jet did he not usually find oily vapor, either gathered on the door below, in the middle, or in the bottom, the material having been heated on the bottom of the box by the introduction of the cap with the steam jet?

Mr. Thompson—Once in a while I would find a trace of it, particularly when the oxide, in the position of "first box" had accumulated a deposit of oily vapors, or rather naphthaline. Our sovereign remedy was the use of that very steam, the introduction of which with air would drive off every particle of the naphthaline.

Mr. A. S. Miller—Perhaps I was in error when I said Mr. Baxter said something about the packing to the extent of 2 inches. I do not find it. It must have been some other idea that occurred to me. My general idea in this change was to prevent packing, and that is why I blew up instead of down.

Mr. Harbison—This subject of purification is a very interesting one. I can remember when our much lamented and beloved brother Forstall so enlightened us on the subject of purification—the worthy father of worthy sons, both of whom we love and esteem. He then showed us what he was doing with lime, brought samples of the foul lime to the meeting and gave us his results, which prior to that time had been unheard of. Since then the gentlemen to whom I have listened to-day have substituted oxide purification for lime. At the risk of bringing our friend Hayward to his feet, and hoping I may do so, and be sustained in his statements, and supported by those who used oxide, I would like to inquire the advantage of using it, with its attendant pleasures to which we have listened to-day—the difficulties in revivifying and all that sort of thing, over the use of lime. I have made no change. No change was made in our works, since starting them in 1849, in the kind of material used for purification, and we are getting fairly good results as compared with anything we have heard here to-day. I would like to have somebody tell me the advantage of using oxide at all. Our make of gas in the year 1896 was about 200,000,000 cubic feet, and for more than 5 calendar months of the year 1896 there was not an hour's work done in our purifying house, except to whitewash the walls of the building. During those 5 months we passed through our meters more than 75,000,000 cubic feet of gas; our boxes are 20 ft. x 24 ft., with 16-inch connections. Now, I would like to have some good reason given me why we should change from lime to oxide.

Mr. Walbridge—I do not know that I can answer Mr. Harbison. I will state that in comparison with his result, we have passed approximately an equal amount of gas, in the same length of time, through boxes in a house in which no work has been done, not even whitewashing the walls. And those boxes have not been changed

for over a year and a half, beginning at the beginning of that 5 months' period. May be that would enlighten Mr. Harbison.

Mr. Harbison—What material are you using?

Mr. Walbridge—Oxide.

Mr. Moss—It seems to me that this question has been discussed from a wrong standpoint, inasmuch as purification is nothing more nor less than a chemical reaction. Consequently to analyze the results in two places we must take the amount of sulphur; if we use lime, the amount of carbonic acid. It may be in the case of Mr. Harbison, as in the limestone districts in England, it is cheaper to use lime. There are other places where it is cheaper to use oxide. As far as I know, taking London, for instance, the cheapest method of purification is the rotation system in which both lime and oxide are used—the lime to take up the carbonic acid and the oxide to take out the sulphureted hydrogen, introducing at the same time from 1 to 1½, or even 2 per cent. of air in the last oxide box to keep up a slow revivification. In that way, we can easily work our oxide up to 48 per cent. of sulphur.

Mr. Thompson—I can hardly take Mr. Harbison seriously in the question he asks. If he is really anxious for knowledge I think nothing would be more appropriate than to refer him to the files of proceedings of the several gas associations.

Mr. Jenkins—This is interesting. We have been working on a lot of oxide of iron for some time, and we are not through yet. I would ask Mr. Harbison how much lime he uses?

Mr. Harbison—300 bushels of lime at a time.

Mr. Jenkins—That makes about 75,000 feet of gas purified per bushel of lime. Do you revivify the lime?

Mr. Harbison—No.

Mr. Thompson—Has anybody ever tested Mr. Harbison's gas for sulphur?

Mr. Harbison—It is tested every two hours.

Mr. Moss—I would ask Mr. Thompson if he has had any experience in revivification in the purifiers whilst working—whether it is not cheaper to revivify whilst the purifiers are passing the gas than it is to lay off the purifier and revivify?

Mr. Thompson—In answer I would say I certainly prefer to introduce a small percentage of air during purification and then introduce it in the off box for further saving in labor, as far as that can be carried to advantage.

Mr. Harbison—If I dare assume that the subject of purification is somewhat exhausted, there is another matter upon which I would ask the Wrinkle Department for information. That is the making of joints in street mains. In our climate and soil we use lead exclusively; never attempt to make cement joints. The frost goes very deep. As those who use lead find, we have leaky joints. I was talking a few days ago with the Hon. J. G. Batterson, President of the Travellers' Insurance Company, an expert builder, having large building operations, who asked me whether I had ever used any antimony with the lead, and I said no. I would ask whether any member has had any experience in that regard, and what percentage he used. Mr. Batterson said that in the cooling process with the proper admixture of antimony the lead will expand instead of contract, and he said he thought a joint could be made that would be perfect, illustrating the matter or point he made by saying that in his experience,—he built the State capitol building in Hartford,—in handling granite blocks the edges were often found to be chipped where the two surfaces came together, and he was called upon to make them good. There was some question of damage, and he experimented and found that by getting type metal, melting it and cutting into the joints and running the melted type metal in, he found that he filled up the space fully on the inside, and that it could lift 250 tons above it by the expansion that occurred. If such a mixture would make our street main joints tight it is an important matter. I have not tried the experiment, but will very soon.

Mr. A. S. Miller—I would like to know what you will do in case they start leaking?

Mr. Harbison—I shall answer Mr. Miller by saying that I never cross a bridge until I get to it.

Mr. Thompson—Undoubtedly the tendency of the addition of antimony would be to make the lead much harder. I think, however tight the pipe may be when it was originally laid, the expansion and contraction during frosty weather would have a tendency to pull the joints, and the presence of antimony then would make the metal very much harder to caulk. As no one else has answered about cement, I might say it is my preference to use but one joint in ten of lead, the balance being cement. If we have frosty weather, the frost penetrating the ground to a depth considerably greater even than where the pipe lays, I would rather have a main broken, which break I would find, than to have a leak every 12 feet, which I might *not* find. When you so lay cement joints you can mark them on the curb with a chisel to indicate the position of the lead joint. You can locate it then and bar for it easily.

Mr. Egner—I hope Mr. Harbison may give us information on the point of lime purification. While asking for information he has given us something to think about. I would be glad if he would tell us how he does it.

Mr. Harbison—Some years ago we employed a man to take care of the gas works yard, some of you gentlemen have met him. An arrangement has been devised by him in the introduction of the oil, and the results have come from that time. I have suggested the propriety of his patenting this arrangement, and he has been considering that question—the introduction of the oil in the water gas department. On that plan we have had these phenomenal results in purification. That is as much as I can tell you about it at present.

Mr. Thompson—Do I understand these are purifiers which only handle water gas?

Mr. Harbison—They purify gas which is about 60 per cent. water gas and about 40 per cent. coal gas. We have made no change in the kind of material used. We use the best quality of Penn and Cannelton coal in the coal gas department and anthracite coal in the water gas generator with Standard Oil Company products for enriching.

Mr. Thompson—I think when Mr. Harbison returns home, if he will make a test he will find that the lime taken from the purifiers is thoroughly carbonated.

Mr. A. E. Forstall—I think we would all be obliged to Mr. Harbison if he would have an analysis of his gas made, so that we can see just how much carbonic acid and sulphureted hydrogen it contains. I know there is a certain prejudice in the minds of some men, in fact in the minds of a great many, against abstract science, but chemistry tells us that certain elements will combine with certain other elements, in certain known proportions by weight. With gas containing, say, three per cent. carbonic acid, if lime is to be used solely for carbonic acid purification, according to the chemical books it will only purify, assuming it to be pure hydrate of lime—something under—(I am giving these from memory), 10,000 cubic feet per bushel. That is a rough guess. It is under that. So as Mr. Harbison is purifying 25,000 feet to the bushel, he must have 3 per cent. divided by 2½, which is practically a little over 1 per cent. of carbonic acid in his gas, and no sulphureted hydrogen. I would like to know how to get gas of that composition.

Upon motion of Mr. Jenkins a vote of thanks was extended to Mr. Thompson for conducting the "Wrinkle Department."

The vote of thanks having been acknowledged by Mr. Thompson, the Secretary read Mr. Thompson's declination to longer serve as Editor of the "Wrinkle Department." Secretary Dunbar, in moving the acceptance of the resignation, said it was undoubtedly with great regret that the Association heard of Mr. Thompson's determination. Mr. Thompson, however, persisted in asking to be relieved from further duty in this line, and it was the duty of the Association to listen to his demand. The resignation was accepted. On motion of Secretary Dunbar, Mr. E. H. Jenkins, of Covington, Ky., was elected to succeed Mr. Thompson as Editor of the "Wrinkle Department."

QUESTION BOX.

The President said that as there was only one question in the Question Box, it might be discussed preliminary to the afternoon adjournment. The suggestion was agreed to, and the Secretary read the question:

"What is the best method of automatically keeping the hydraulic main free of tar?"

The question was assigned for answer to Mr. J. R. Lynn, who said: "I would state that where heavy tar is produced, it would be an utter impossibility; where a light grade is obtained the best method would be to take the tar off from a tap at the bottom of the main, carry a pipe forward until it passes the hydraulic, then upward, leaving an open end in a tee at the top, and then bring another pipe over and run down, connecting with the discharge for the tar. Probably where a grade of tar which would be considered rather heavy is produced it might be taken off automatically if the center, or wherever the tar was taken away was lower than the remainder of the hydraulic. But at the same time the water would have to be regulated by a valve so that the amount of water entering the main would equalize the amount of tar produced and passing away. I wish to emphasize the fact that there must necessarily be an open end on the upright, that must be carried to such a height as to retain a seal in the hydraulic.

The President announced that there would be a meeting in the evening, at 8 o'clock, for the election of officers, to which hour the sessions were declared adjourned.

PROCEEDINGS, THIRD ANNUAL MEETING, TEXAS GAS AND ELECTRIC LIGHT ASSOCIATION.

(*Continued from page* 844.)

vice runs from 25 cents to 15 cents per lamp per month, the rate being graded by the number of lamps the customer has. If a concern has 25 or 30 lamps, a man consumes no more time in taking care of them than he does in visiting a place where only one lamp is in use. The first large single installation we made was in a retail clothing house, the proprietor of which is a Hebrew. Prior to his trial of the Welsbach lamp, he, like many others, thought the meter would show no difference whether ordinary or Welsbach burners were used for lighting. In fact, he thought the meter worked, whether the burners were on or off. The other day, when the collector visited him, his partner, who was standing by, noticing that the bill was to be paid without any objection, asked in astonishment, "Why don't you complain?' The reply was, "Vell, venever I do they tinks I am mad, and I shust quit." We have had much less complaint from him since we inaugurated this system. I will state further, that the Dallas plant probably introduced the first Welsbach burner that was brought to the United States—I kept one of those burners as a relic. It consumed 5 feet of gas and gave a light of about 14 candle power when first put in. In '92 we purchased some lamps from the Welsbach Company that gave 32 candle power. Some months afterward they found the lacking ingredient, as Col. Sellers says, and the lamps jumped up in candle power from 32 to 64, the test running from 64 to 73, and from that time on the introduction of the lamp has been steady. One gas customer who runs a saloon had, in '95, one Lungren lamp and two ordinary open flame burners, and his bill for September that year was $6.50. In October he put in three Welsbachs, and his bill for that month was $3.35. He was also much better pleased with the light obtained. There is no doubt about the saving in gas to the consumer. Mr. Holmes says the Welsbach lamp gives a light that looks green to the electric men. I think the greenness is usually the result of not understanding how to adjust the air and the gas to get the best results. We have very few burners now that we ever hear any such complaint from.

Mr. Cox—Isn't it a fact that the Welsbach agents are making contracts to-day for the free renewals of mantels?

The President—I haven't heard of any.

Mr. Cox—I asked a saloon keeper in Galveston, who changed his lights from electric to gas, regarding it, and he said the Welsbach agents contracted to renew them. That's all the information I have.

The President—Isn't the agent in Galveston a man in no way connected with the gas business?

Mr. Cox—In no way connected.

The President—Then how he can find it to his interest to renew the lamps is a mystery to me.

Mr. Cox—That's the way I looked at it.

The President—I don't know of any city where mantles are renewed without charge. There are customers you know who will say almost anything if they think they will get anything out of you.

Mr. Holmes—In the average of cases do you find that the size of the gas bill is reduced materially, or do they burn enough additional gas to make the bill as large as it was with the ordinary burners?

The President—The illustration I gave is about as good an answer to the question as I can make to it. The individual consumer will reduce his bill from 25 per cent. to 50 per cent. with the Welsbach lamp; he does get from three to four times as much light. I don't figure the saving is that much, when I figure the cost of the mantles and chimneys. If the Welsbach lamps are put in throughout the entire service it will be materially felt, but by the use of the lamp we have been able to hold customers that otherwise we could not, and we have increased our number of consumers enough to compensate for what it has cut down on the old consumers.

Mr. Holmes—In practice there is no reduction in the sendout?

The President—To take a specific time that would not apply; but, in a long time, it will keep up even anyhow. In Dallas, about a year ago this month, all the stores shut up at 6:30 P.M., with the exception of Saturday night, something they never did before except right in midsummer. As they kept it up all year we felt that action in our sales of gas.

No. 5. "What has been the experience of the members of this Association with prepayment meters? Under what conditions and to what extent do you place and use them?"

Mr. Holmes—I asked that question. I bought a few prepayment meters two years ago and didn't meet with much success in introducing them. We required a deposit from all consumers or a guarantee. To one consumer, who claimed that the stove consumption of gas was too great, that he couldn't control it in any way, I suggested that he put in a prepayment meter which would enable him to keep track of how much he spent every day for that stove. However, we only succeeded in cutting the bill down very little. I believe that the prepayment meter, from what I hear of it, will bring more money in than if the bill is rendered once a month.

No. 6. "What do the members of this Association know of the recently developed oil fields at Corsicana, Texas? To what extent has the oil been used for gas making, in what description of apparatus, and with what results?"

Mr. Oliger—I know several places using that oil for fuel under the boiler, taking the place of coal. One superintendent informed me a few days ago that he had been able to reduce his fuel bill, by using this oil, $2 per day, and the saving of the services of one man for six hours of the day.

Mr. Cox—Do you know the price of that oil?

Mr. Oliger—Fifty cents a barrel; f.o.b., Corsicana.

Mr. Cox—Are you sure as to the price?

Mr. Oliger—Yes, sir; I have my information from Mr. Beaton, who is secretary of the oil company. That was about a month ago.

Mr. Yaeger—Was this from a man that had used that as fuel?

Mr. Oliger—Yes; I referred to Mr. Walter when I spoke of the superintendent who used the oil.

The President—I made an investigation of that oil field last December. Three or four wells are now yielding somewhere in the neighborhood of about 60 barrels of oil in a day. Mr. Fitzgerald, who has used that oil in Houston, wrote this note and handed it to me—he has just gone to the train. He says: "Corsicana oil for making gas seems fixed, and I will say in regard to it that it has been very satisfactory. It is a cleaner oil than we had been getting from Ohio, and the specific gravity is higher. There is no doubt in my mind that it will be greatly used in the State for gas making, if the supply is sufficient and lasting, which, at present, seems to be the case. The whole question in my mind is, have we got an oil field that will stay; they are sinking another well now, and I presume it is about down.

Mr. Oliger—The price of coal delivered at Waxahachie, where Mr. Walter is located, was $3.45 a ton, f.o.b.

Mr. Cox—Can you tell us something near about the horse power he was developing when he made the test?

Mr. Oliger—I could not.

A Member—I think he was developing about 80 on an average.

Mr. Oliger—Do you know the horse power he put in?

Mr. Weaver—An engine of about 125-horse power.

Mr. Oliger—I think you are mistaken, for I know he has something over 1,500 lights, to say nothing of his day power.

The President—The Corsicana Flour Mill, with coal, ran two boilers—I don't recall the size of the boilers, but should say they were at least 50-horse power, but when they put in oil they ran on one boiler.

Mr. Cox—The figures given—80-horse power for 24 hours—would make a coal consumption of about 6 tons per day.

Mr. Oliger—I have talked with other parties about that oil, and they claim that you can do away with the services of one man.

The President—Practically, you do.

Mr. Oliger—Say you were paying the fireman $40 or $45, it would be a saving of that amount. It is not any more trouble to keep the oil regulated than to give a little attention to the voltage. He says the two need about the same watching.

Mr. Cox—Do you know how many barrels a day he gets, or how he ships it?

Mr. Oliger—No, sir; I do not. The first time I wrote to Mr. Walter for information about the oil he told me he was getting excellent results; that he could arrange his flow of oil and, in the words of the fireman and engineer, go to sleep, and there would be no variation in the steam.

Mr. Cox—I don't see how that would be possible.

Mr. Oliger—He says that is one of its main features. Another thing, it is very cleanly. Later on I found out that Mr. Walter was Mayor of the town, and connected with its light supply; also with the oil wells.

The President—Not with the wells, in any way.

Mr. Cox—Assuming that the figures are 80-horse power, and running 24 hours, and say with a saving of about $6 a day, and the cost of oil at 50 cents a barrel, he would be now consuming somewhere in the neighborhood of 30 barrels a day, assuming that the figures are correct.

The President—Oh, I suppose he hardly averaged over 25.

Mr. Monroe—I had occasion to investigate the relative economy between coal and oil just before leaving Chicago three years ago. We found we could afford to use oil at 1.1 cents per gallon, in preference to coal at $3.75 per ton. Of course, we had other expenses there which were strongly in favor of the oil. It cost us, as I recollect, 50 or 75 cents a load to haul away the ashes, and then we had to put up a fine every 30 or 45 days on the smoke, and for that reason the economy was in favor of the oil. But we investigated the matter further with parties that had been using the oil, and found that they were subjected to gradual rises in the prices of oil, as soon as they fixed their boilers for oil.

Mr. Yaeger—I would like to ask the question if anyone here knows what is the expense of a 100-horse power return tubular boiler—the expense for putting in a boiler for consuming oil? This is a new subject to me, but it is very interesting to all producers of power. I think it is one of the most interesting things we have had before us.

It being announced that Mr. Adams was well posted on this question of oil, the President invited Mr. Adams to give his experience, which he did as follows:

Mr. Adams—I am not so well posted as to definite information on it. I do know that it is going to cut a very great figure in the coal business, especially in Corsicana and places near there. We operate the ice factory there, and we will not burn any more coal. We can save something like $7 or $8 a day.

The President—He sells the coal, too?

Mr. Adams—That's a fact, also. We sell the coal to ourselves, and we can better afford to burn the oil and save the money ourselves. I don't know whether it will pay to ship it. It is a business, I understand, that will be conducted about like the lignite; if they can't sell it for one price they will sell it for half that, because they can well afford to sell it at half the price they began on. That was the case with lignite, the price of which is now greatly reduced from what it was a year ago.

The President—The commission rate on that oil is quite low now. I understand it is to be shipped to Waco to be used there.

Mr. Green—Mr. Reagan, Superintendent of the Gas Company at Waco, has been in correspondence with the oil people for some time. I didn't keep up with the correspondence, but think their reply to us was that they could not keep up with the orders; that it was being used at Corsicana. I don't think any prices were quoted; they just said they couldn't furnish the oil at all.

Mr. Oliger—I have had some correspondence with Mr. Beaton about the rates at Cleburne. The best rate I could get from the Santa Fe was 25 cents a hundred. I asked how many barrels of oil would equal a ton of good coke or straight lump coal, and his reply, if I remember, was 3 barrels to the ton of coal.

The President—Do you know that the Commission established a rate on this oil about six weeks ago?

Mr. Oliger—No, sir. The freight agent of the Sante Fe telephoned me at the office Friday that they got 25 cents a hundred.

The President—The Commission rate on that oil to Houston is 25 cents; Corsicana to Dallas, 7 cents.

Mr. Holmes—I remember some time ago they quoted us, Corsicana to Austin, tank car lots, 35 cents.

The President—I am speaking of tank car lots.

Mr. Oliger—Will the tank cars be hauled exclusively by one line?

The President—That would depend on whose tank it was. I suppose you are confined to one line.

Mr. Monroe—You need not worry; it will be the Standard Oil Company in a year, if the oil is all right, and there will be no economy in using it. I want to add, further, for the benefit of the members who are investigating this oil business, that it is mighty good policy to go very slow with it until the oil field is fully developed. It is something outrageous the way the people around Chicago were used on oil. The Chicago Arc Light Company and a Chicago street railway company, in making arrangements to put in the boilers and tanks and everything for the use of oil, expended several thousand dollars. As soon as they were fairly started, the price of oil was raised, and in time the rate was made so high that they had to go back to coal.

The President—Expert oil men have declared that the oil at Corsicana cannot be refined to advantage, and it would not be economy to begin refining it under 100-barrel lots, and it is very doubtful then if it be oil with a paraffine base. The probability of having the oil refined is not so great as if the oil were on a paraffine base and suited for refining.

The annual

Report of the Secretary

was then read as follows:

Gentlemen: As Secretary of our Association, I have, since our last meeting, received 19 applications for active membership and 10 applications for associate membership. All applicants have been approved by examination committee and elected members. We now have 44 active and 17 associate members. So far as I have been able to learn, we have lost none of our members by death. There have been dropped for non-payment of dues 4 active and 1 associate members. I have collected initiation fees and dues (since last report) from 33 active and 11 associate members, amounting to $178.50; and from the chairman of the banquet committee, $100; total receipts, $278.50.

I have had printed 250 copies of the official notice of this meeting and sent same to the principal trade papers, to all the members of our Association, and to all other parties that I knew or could hear of that might be interested in our Association. I have also had printed, and have mailed to members and others, 450 circular letters and 100 postal cards addressed to the Secretary of the Texas Gas and Electric Light Association, Gonzales, Texas, on which were printed statements as to whether or not the party expected to attend this meeting; also, whether or not he would go on the proposed excursion to Mexico. So few cared to go on this trip that the arrangement committee decided not to attempt any excursion this year. I also mailed to each member of the Association a question blank and envelope, addressed to "Question Box, Texas Gas and Electric Light Association, Menger Hotel, San Antonio, Tex." I also mailed to each member of the Association a question blank and envelope addressed to "Question Box and Wrinkle Department, Texas Gas and Electric Light Association, Menger Hotel, San Antonio, Tex." On motion, the report was accepted.

Votes of Thanks.

The President—One thing I wish to call to your attention, so that you may take such action as you deem necessary. A year ago our good and handsome friend "Harry" Monroe, with a great deal of effort and considerable expense, got up a small electrical exhibit. That was the nucleus about which this magnificent gas and electric exhibit appears here to day. The exhibit we have here to day has been a benefit to the Association and to the entire State. A great many citizens have visited the exhibit, and I understand they are talking about it a great deal. It will be of great benefit, particularly to the citizens of San Antonio. I think an expression of this Association is due to the manufacturers who have made this exhibit, and particularly to Mr. Monroe who inaugurated the plan.

Mr. Judge embodied the thought expressed by the President in a motion, and it was carried.

Mr. Holmes—I move the Association extend a vote of thanks to the San Antonio Gas Company, officers and employees; to the San Antonio Street Railway Company and Superintendent T. C. Brown; to the City of San Antonio, its Mayor, Judge Callaghan, and the citizens of San Antonio in general; to the Menger Hotel; to the Press and to the Chiefs of Police and Fire Departments. As a matter of fact, gentlemen, so many courtesies have been shown us on all sides by all parties that it would be hard to detail them now. However, I think those mentioned especially should have a hearty vote of thanks. (Motion carried.)

The President—I think this Association is indebted to our Secretary for his liberal efforts in the interest of the Association, and I suggest that a proper vote of thanks be extended to him. I feel that he has done a great deal to bring about this successful meeting, and he is retiring now with a great deal of satisfaction, I have no doubt.

Mr. Yaeger—I was about to ask the Association to extend its vote of thanks to the Secretary, and not only the Secretary, but also to our worthy President. I make a motion in accordance with these suggestions, including the President with the Secretary. (Motion carried.)

Next Place of Meeting.

On motion of Mr. Brooke, Laredo was named as the next place for meeting, after which action the convention was declared adjourned.

In the proposed new ordinance for the Houston (Texas) Gas Light Company it is specified that the charges for connecting with mains from sidewalk to meter shall not exceed the cost of material and labor, plus 10 per cent. additional; also, that no charge shall be made to consumers for the use of meters, but when meters are not in use they can be taken out by the Gas Company, unless the consumer agrees to pay 50 cents per month rental for the same. The specification is further made that meters shall be subject to the inspection of the authorized agents of the city. The provisions of the ordinance in respect to the rate that may be charged seem onerous. It is directed that gas of a candle power not below 18 shall be supplied at $1.50 per 1,000 (maximum), and that no charge shall be made for gas supplied to the public buildings (except public schools) to be used for public account.

[Prepared for the JOURNAL.]

Locating, Determining and Laying of Street Mains and the Distribution of Gas.—No. V.

By MR. J. P. GILL.

Let the last length of 2,100 yards, from D″ to D‴, be divided into two lengths of 1,100 yards and 1,000 yards delivering respectively 500 cubic feet, with the pressure at D″ of .58 inch. What will be the diameters and pressures?

(10″) D″ to D^a, $D^5 = \frac{.0000003 \times (1{,}000)^3 \times 2{,}100}{.58} = 1{,}086$,

requiring a 6-inch pipe.

$$f = \frac{.0000003 \times (1{,}000)^3 \times 1{,}100}{7.776} = .04 \text{ inch.}$$

.58 — .04 = .54 inch, the pressure at D^a.

(10‴) D^a to D‴, $D^5 = \frac{.0000003 \times (500)^3 \times 1{,}000}{.54} = 139$,

requiring a 3-inch pipe from D^a to D‴.

$$f = \frac{.0000003 \times (500)^3 \times 1{,}000}{243} = .31 \text{ inch.}$$

.54 — .31 = .23 inch, the pressure at D‴.

These calculations may now be tabulated. (See Table No. 3.)

Suppose again, that the main supply pipe from B to B‴ should pass twice the quantity of gas as it has in the preceding examples, half for the east districts as before, and half from those west of it; and that from D to D‴, half for west districts as before, and half from those east of it.

These pipes will deliver as follows to the several districts:

	Cubic Feet.		Cubic Feet.		Cubic Feet.
B to B′,	3,500 to district (1);	3,500 to district (2);	total,	7,000
B′ to B″,	3,000 " (5);	3,000 " (6);	"	6,000
B″ to B‴,	1,500 " (9);	1,500 " (10);	"	3,000
				16,000
C to C′,	4,500 to district (2);	4,000 to district (3);	total,	8,500
C′ to C″,	9,000 " (6);	7,000 " (7);	"	16,000
C″ to C‴,	5,500 " (10);	5,000 " (11);	"	10,500
				35,000
D to D′,	1,500 to district (4);	1,500 to district (3);	total,	3,000
D′ to D″,	2,000 " (8);	2,000 " (7);	"	4,000
D″ to D‴,	1,000 " (12;	1,000 " (11);	"	2,000
				9,000
Sum total.....				60,000

From C to B‴, 16,000 cubic feet are delivered.
" C to D‴, 9,000 " "
" C to C‴, 35,000 " "

The total lengths running westerly and easterly will be the same as before; also, the total quantities delivered to the several districts. The detailed lengths vary; but these do not enter into the calculation, since the lengths between A and B, and D and E remain the same, being 900 yards each. (See plate No. 4.)

The following calculations show the sizes of the pipes, and the pressures.

(1) G to C‴, $D^5 = \frac{.0000003 \times (60{,}000)^3 \times 5{,}400}{1} = 5{,}832{,}000$,

requiring a 24-inch pipe from G to C.

(1′) G to C, $f = \frac{.0000003 \times (60{,}000)^3 \times 100}{7{,}962{,}624} = .01$ inch.

1.00 — .01 = .99 inch, the pressure at C.

(2) C to C‴, $D^5 = \frac{.0000003 \times (35{,}000)^3 \times 5{,}300}{.99} = 1{,}967{,}424$,

requiring a 20-inch pipe from C to C′.

(2′) C to C′, $f = \frac{.0000003 \times (35{,}000)^3 \times 900}{3{,}200{,}060} = .10$ inch.

.99 — .10 = .89 inch, the pressure at C′.

(3) C′ to C‴, $D^5 = \frac{.0000003 \times (26{,}500)^3 \times 4{,}400}{.89} = 1{,}041{,}539$

requiring a 16-inch pipe from C′ to C″.

(3′) C′ to C″, $f = \frac{.0000003 \times (26{,}500)^3 \times 2{,}300}{1{,}048{,}576} = .46$ inch.

.89 — .46 = .43 inch, the pressure at C″.

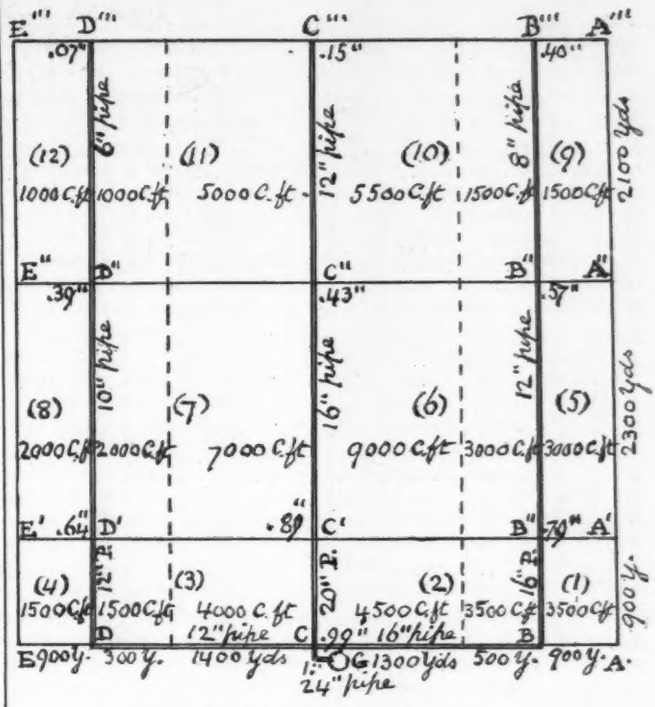


Plate No. 4.—Main Supply Pipe.

(4) C″ to C‴, $D^5 = \frac{.0000003 \times (10{,}500)^3 \times 2{,}100}{.43} = 161{,}529$,

requiring a 12-inch pipe from C″ to C‴.

(4′) C″ to C‴, $f = \frac{.0000003 \times (10{,}500)^3 \times 2{,}100}{248{,}832} = .28$ inch.

.43 — .28 = .15 inch, pressure at C‴.

(5) C to B‴, $D^5 = \frac{.0000003 \times (16{,}000)^3 \times 7{,}100}{.99} = 550{,}788$,

requiring a 16-inch pipe from C to B′.

(5′) C to B′, $f = \frac{.0000003 \times (16{,}000)^3 \times 2{,}700}{1{,}048{,}576} = .20$ inch.

.99 — .20 = .79 inch, the pressure at B′.

(6) B′ to B‴, $D^5 = \frac{.0000003 \times (9{,}000)^3 \times 4{,}400}{.79} = 135{,}342$,

requiring a 12-inch pipe from B′ to B″.

(6′) B′ to B″, $f = \frac{.0000003 \times (9{,}000)^3 \times 2{,}300}{248{,}832} = .22$ inch.

.79 — .22 = .57 inch, the pressure at B″.

(7) B″ to B‴, $D^5 = \frac{.0000003 \times (3{,}000)^3 \times 2{,}100}{.57} = 9{,}947$,

requiring an 8-inch pipe from B″ to B‴.

(7′) B″ to B‴, $f = \frac{.0000003 \times (3{,}000)^3 \times 2{,}100}{32{,}768} = .17$ inch.

.57 — .17 = .40 inch, the pressure at B‴.

(8) C to D‴, $D^5 = \frac{.0000003 \times (9{,}000)^3 \times 7{,}000}{.99} = 171{,}818$,

requiring a 12-inch pipe from C to D′.

(8′) C to D′, $f = \frac{.0000003 \times (9{,}000)^3 \times 2{,}600}{248{,}832} = .35$ inch.

.99 — .35 = .64 inch, the pressure at D′.

(9) D′ to D‴, $D^5 = \frac{.0000003 \times (6{,}000)^3 \times 4{,}400}{.64} = 7{,}425$,

requiring a 10-inch pipe from D′ to D″.

(9′) D′ to D″, $f = \frac{.0000003 \times (6{,}000)^3 \times 2{,}300}{100{,}000} = .25$ inch.

.64 — .25 = .39 inch, the pressure at D″.

TABLE No. 3.—*Main Supply Pipes.*

Sections.	Specific Gravity.	Q' Quantity Used in the Districts to be Supplied. Cubic Feet.	Q Quantity Passing through the Districts. Cubic Feet.	Districts Supplied. Numbers.	L Length. Yards.	H Pressure. Inches.	f Pressure Lost by Friction. Inches.	D Diameter. Inches.	h Pressures at Ends of the Pipes.
(1) G to C'''	.5		60,000		5,400	1.00		(24)	
(1') G to C	"		60,000	all	100	1.00	.01	24	.99
(2) C to C'''	"		47,500		5,310	.99		(24)	
(2') C to C'	"	12,500	47,500	2, 3	900	.99	.08	24	.91
(3) C' to C'''	"		34,000		4,400	.91		(20)	
(3') C' to C''	"	13,000	34,000	6, 7	2,300	.91	.25	20	.66
(4) C'' to C'''	"		13,060		2,100	.66		(12)	
(4') C'' to C'''	"	21,000	13,000	10, 11	2,100	.66	.43	12	.23
(5) C to B'''	.5		8,000		7,100	.99		(12)	
(5') C to B'	"		8,000	1	2,700	.99	.21	12	.78
(6) B' to B'''	"		4,500		4,400	.78		(12)	
(6') B' to B''	"	3,500	4,500	5	2,300	.78	.06	12	.72
(7) B'' to B'''	"		1,500		2,100	.72		(6)	
(7') B'' to B'''	"	3,000	1,500	9	2,100	.72	.18	6	.54
(7'') B'' to B'''	.5		1,500		2,100	.72		(6)	
B'' to B^a	"		1,500		1,100	.72	.10	6	.62
(7''') B^a to B'''	"		700		1,000	.62		(3)	
B^a to B'''		800	700		1,000	.62	.60	3	.02
(8) C to D'''	.5		4,500		7,000	.99		(10)	
(8') C to D'	"		4,500	4	2,600	.99	.22	10	.77
(9) D' to D'''	"		3,000		4,400	.77		(8)	
(9') D' to D''	"	1,500	3,000	8	2,300	.77	.19	8	.58
(10) D'' to D'''	"		1,000		2,100	.58		(6)	
(10') D'' to D'''	"	2,000	1,000	12	2,100	.58	.08	6	.50
(10'') D'' to D'''	.5		1,000		2,100	.58		(6)	
D'' to D^a	"		1,000		1,100	.58	.04	6	.54
(10''') D^a to D'''	"		500		1,000	.54		(3)	
D^a to D'''	"	500	500		1,000	.54	.31	3	.23

TABLE No. 4.—*Main Supply Pipes.*

Sections.	Specific Gravity.	Q' Quantity Used in the Districts to be Supplied. Cubic Feet.	Q Quantity Passing through the Districts. Cubic Feet.	Districts Supplied. Numbers.	L Length. Yards.	H Pressure. Inches.	f Pressure Lost by Friction. Inches.	D Diameter. Inches.	h Pressures at Ends of the Pipes.
(1) G to C'''	.5		60,000		5,400	1.00		(24)	
(1') G to C	"		60,000	all below	100	1.00	.01	24	.99
(2) C to C'''	"		35,000		5,300	.99		(20)	
(2') C to C'	"	25,000	35,000	2, 3	900	.99	.10	20	.89
(3) C' to C'''	"		26,500		4,400	.89		(16)	
(3') C' to C''	"	8,500	26,500	6, 7	2,300	.89	.46	16	.43
(4) C'' to C'''	"		10,500		2,100	.43		(12)	
(4') C'' to C'''	"	16,000	10,500	10, 11	2,100	.43	.28	12	.15
(5) C to B'''	.5		16,000		7,100	.99		(16)	
(5') C to B'	"		16,000	1 and part 2	2,700	.99	.20	16	.79
(6) B' to B'''	"		9,000		4,400	.79		(12)	
(6') B' to B''	"	7,000	9,000	5 and part 6	2,300	.79	.22	12	.57
(7) B'' to B'''	"		3,000		2,100	.57		(8)	
(7') B'' to B'''	"	6,000	3,000	9 and part 10	2,100	.57	.17	8	.40
(8) C to D'''	.5		9,000		7,000	.99		(12)	
(8') C to D'	"		9,000	4 and part 3	2,600	.99	.35	12	.64
(9) D' to D'''	"		6,000		4,400	.64		(10)	
(9') D' to D''	"	3,000	6,000	8 and part 7	2,300	.64	.25	10	.39
(10) D'' to D'''	"		2,000		2,100	.39		(6)	
(10') D'' to D'''	"	4,000	2,000	12 and part 11	2,100	.39	.32	6	.07

(10) D'' to D''', $D^5 = \frac{.0000003 \times (2,000)^2 \times 2,100}{.39} = 6,462$,

requiring a 6-inch pipe from D'' to D'''.

(10') D'' to D''', $f = \frac{.0000003 \times (2,000)^2 \times 2,100}{7,776} = .32$ inch.

$.39 - .32 = .07$ inch, the pressure at D'''.

The preceding calculations may now be tabulated. (See Table No. 4.)

Three different systems of feed or main supply pipes have now been presented; the further consideration of which will be deferred until the method of determining the pipes for the supply of the several districts is exemplified. In the above estimates, it has been assumed that there are no connections, or imperfect ones, between the east and west districts and the intermediate ones, except at the commencement. For the present this assumption will be continued.

[To be Continued.]

The Commercial Uses of Coal Gas.—No. III.[1]

By MR. THOS. FLETCHER, F.C.S., in the *Gas World*.

Enameling on Metal.—The number of firms engaged in this work is very large, about 140 in London alone, and comparatively few use coal gas, although it may be used for the smaller and more delicate work with advantage. The only fuel which can compete with gas for this class of work is retort carbon, and I am informed that owing to the very small supply the price has gone up until it is almost prohibitive. I am also commercially in a very large enameling works where gas coke is used as a fuel, and I find that it will be distinctly advantageous to use small, gas-fired muffles for the smaller work; and preparations are now being made for this. For the smaller users gas is almost a necessity. As in all other muffle work, for the sake of economy the

1. For No. II., see JOURNAL, May 3, 1897, p. 682.

muffles and furnaces should be no larger than absolutely required. If the quantity of work admits, two sizes of furnace should be used, the cost of working a muffle 14 inches square being double that of working one 10 inches square; and as this averages about 2s. 6d. and 5s. per day respectively, the matter is well worth consideration to the user, although the value of the work which can be turned out in 10 hours is so great that the proportion of cost to the value of the result is infinitesimal. Nothing encourages the extension of the commercial use of gas fuel so much as absence of waste, combined with perfect results.

Muffle Furnaces.—The average working cost of these is very closely ruled by the area of the floor of the muffle inside. When a fireclay muffle is used, the following will be the average consumption in muffle furnaces working with ordinary atmospheric burners, without air under pressure. When air under pressure or metal muffles are used the gas consumption is reduced considerably, but reliable figures are not yet available. Iron muffles are a distinct advantage for hardening steel tools and cutters, but they are not safe to use over a clear red heat, and as they gradually expand with continued heating they cannot be used very long, for they are liable to burst the outer casing, or become too large to be removed. Fireclay muffles are very liable to crack and want constant repairs. Plumbago stands well, but is costly, and cannot be used for enamels or assay work, owing to its reducing action on oxides. A perfect material for muffles is yet to be discovered. Even pure platinum, which is largely used for certain classes of delicate colored enamels, becomes converted into carbide and breaks up. The importance of this subject may be judged by the fact that one firm with which I am connected has supplied to one dealer alone over 100 muffles during the last six months.

Gas consumption with fireclay muffles; for every 10 square inches of working floor surface of muffle:

Clear red, for hardening steel cutters, etc	8	cubic feet	per hour.
Yellow, for silver assays.....	10	"	"
Bright yellow, for gold assays.....	11	"	"
Yellowish-white, for under glaze china painting and china enamels.....	14	"	"

For enameling on iron, copper, watch dials, jewelry enamels, etc., the consumption will vary between the above, depending on the fusibility of the enamels used. As a rule, the work done is so light that the extra gas expended on this is very trifling; but for heavy steel cutters and blocks 3 cubic feet must be allowed for each pound of metal heated in the muffle. Where the work can be heated by the direct flame, without the intervention of a muffle, about one-half of the above will be found sufficient in practice.

It will be seen that in furnaces of this class the gas consumption is ruled almost entirely by the size of the muffle, and not by the actual useful work done in the furnace. With all their drawbacks, muffle furnaces are absolutely necessary for a great number of different industries; they are made and sold in thousands, and in working practice they are more important to the gas works, as consumers, than any other appliance known. In referring to muffle furnaces it must be remembered that these include "seggar" furnaces for china painting, making filaments for incandescent lamps, case hardening, gold and silver wire annealing, hardening press dies by cementation, and numerous other industries.

Reply to a Puzzled American.—The following appeared in a recent issue of the AMERICAN GAS LIGHT JOURNAL:

The following details and query are from Mr. F. W. Stone, manager of the Ashtabula (Ohio) Gas Company:—"I have a customer here to whom I could sell a great deal more day-consumption gas, provided I could heat a furnace with it. The requirements are that we bring a furnace 24 inches long, 4 inches wide, and of any necessary depth, to a sufficient temperature to heat small pieces of iron, 1¼ inch by ⅝-inch by 6 inches, so that they may be forged under a drop hammer; but one end of the iron is forged at a time. The furnace may be closed at back, ends, and top, an opening being left in front the entire length of the furnace, and of sufficient height to admit of the insertion of the irons into the fire. I have constructed several experimental furnaces; but, even with an air blast, do not seem to be able to attain the desired degree of heat, no matter how much gas can be consumed. I can get flame enough, but not heat enough. An excess of air causes the gas to fire back. It has gotten to be a question of not How much gas? but Can I do it at all? There are circumstances which would make any customer give a good deal to be able to fire by gas. Can you direct me?

The failure in this case is undoubtedly that air under a fairly high pressure—*i. e.*, 1 to 1½ lb. per square inch, is necessary to obtain the intense local heat required for thss class of work, a large flame is quite useless. A fireclay casing, shaped something like a drain pipe, with a row of flowpipes through the top, with the flames directed downwards on the work, would do what is required with ease, provided the air pressure be sufficient. It is a question whether a short furnace with one large blowpipe would not be best, working like a rivet heating furnace, with a loose pile of the blanks under the flame, these being selected as they become hot enough, and fresh blanks being added at each side. The bottom of the clay tube should be curved so that the blanks will naturally fall towards the center. The higher the pressure of air which can be used the greater the speed and economy of working.

Oven Heating.—There is one point of considerable importance in many trade and scientific applications of ovens and heated chambers which has been overlooked—*i. e.*, the great irregularity of temperatures at different levels which occurs in internally heated ovens under certain conditions. If a solid shelf is placed in the center of an internally heated oven, there will, in many cases, be found a difference in the two compartments of 100° or 150° F. For this reason solid shelves should never be used under any circumstances, if the compartment above the shelf is to be used. Internally heated ovens are quite unsuited to hatters for softening hats for pressing, for drying pharmaceutical preparations, and other purposes where an equal heat is required at different levels. This objection does not occur in such work as drying samples of paper pulp boards, for estimating the moisture present, as the samples can all be hung at the same level on sliding bars. If the samples are placed flat at different heights serious errors, involving a risk of considerable loss in valuing, are certain to occur, as samples of what are known in the trade as "sulphite pulp boards" hold their water, are difficult to dry uniformly, and rapidly reabsorb moisture. An error of 1 per cent. in estimating the value of 1,000 tons of wood pulp is a serious thing. This is by no means a small matter to the gas manufacturer, as gas heated ovens are constantly and universally used for this purpose.

Hardening and Tempering Steel Springs.—Many methods are employed, but for the best work the use of gas is almost a necessity. Without an intimate working knowledge of the processes used, it is dangerous to recommend any change. Equal hardening, especially of spiral springs, is almost impossible under the usual system, as steam forms on the surface of the metal, preventing uniform contact with the whole surface at the same moment. This can be remedied by forcing a strong jet or spray of water into the quenching tank, causing violent agitation of the water. The finest and most delicate hair springs are usually wrapped in platinum or nickel foil, heated in a gas-fired muffle, and when at the correct temperature pushed into a quenching tank immediately under the mouth of the muffle. Large springs can be heated in a muffle without other protection than a lump of charcoal or wood in the muffle to absorb the free oxygen, or the metal can be coated with soft soap and slowly dried. For dull or black work a gas heated reverberatory furnace is the simplest and cheapest, no muffle being needed. The advantage of a gas furnace is that it can be kept at the exact heat required, and there is no risk of burning thin edges or ends. For tempering by the process known as burning off, the spring is dipped in oil and then held over a gas flame the same shape as the spring until the oil blazes, when the work must be at once removed and allowed to cool. Gas heated baths of fusible metal are frequently used for tempering very irregular shapes, and for hardening these a bath of pure lead, kept at a red heat in a gas furnace, is used for very important work. A trace of any other metal in the lead frequently causes its rapid oxidation. Pure lead, especially if covered with a little sawdust, lasts a very long time. The best work requires the use of gaseous fuel, as no other admits of the absolute uniformity necessary for springs and other steel articles of irregular shape and thickness. For flat springs a tempering plate is the most satisfactory, although, with care, the open flame can be used. Springs with a heavy boss at the end are very liable to prove unsound near the boss; this is caused in hardening, and can be prevented by using the water slightly warmed. This also applies to thick cutters, coining dies, etc., and a gas burner under the hardening tank will be found useful.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE following is referred to our advertisers:

HUCKINS HOUSE, TEXARKANA, ARK., May 18, 1897.

To the Editors AMERICAN GAS LIGHT JOURNAL: Could you put me in correspondence with a firm or firms making a gas producer, inexpensive enough to use with gas engine of 25-horse power, and make 3,000 cubic feet per day, for cooking and heating. We have a crude oil that can be delivered here at 2 cents per gallon, and a good lignite (or wood) coal, yielding 10,000 to 13,000 cubic feet of gas to the ton, at $2 per ton, or less. Thanking you in advance, I am, yours truly.—J. HUCKINS, JR., Manager.

THE case of Samuel Spencer and associates against the Rome (Ga.) Gas Light Company has been settled. Under the agreement, the first

mortgage bondholders take over the gas plant in settlement of their claim, the second mortgage bondholders agreeing to accept the ownership of the electric plant as their indemnity.

SMITH HICKENLOOPER, son of General Andrew Hickenlooper, has been awarded the Sinton gold medal, at the disposal of the Woodward High School, Cincinnati, Ohio. His general average for course was 95.4 per cent. The correspondent who forwards this mention says: "The Sinton gold and silver medals, awarded in each of the Cincinnati high schools (four in number) for the highest general averages secured during the four years' course, are the highest prizes that the pupils can aspire to. It is not a special effort that involves only a few months' work, but the pupils must constantly keep the prize before them for four years. For this reason the honor of winning a Sinton medal is a much coveted one. Young Hickenlooper's average tells the story of his studious application during the past four years."

MR. DUNCAN JONES, Secretary of the New Orleans (La.) Gas Light Company, is responsible for the statement that a reduction of 25 per cent. in the selling rates will be ordered by the Company, the concession to become effective July 1st.

PRESIDENT DOLE, of the Pomona (Cal.) Gas Light Company, is said to be negotiating for the purchase of the Santa Ana (Cal.) Gas and Electric Company.

MR. EUGENE H. YORKE has been named to succeed his father (the late Mr. William Yorke) as Engineer to the Portland (Me.) Gas Light Company.

THE proprietors of the Brattleboro (Vt.) Gas Light Company have determined to put in operation the following rate schedule, the same to take effect July 1st: To ordinary consumers, on illuminating account, $2.50 per 1,000; to those using over 20,000 cubic feet per month, on illuminating account, $2.25 per 1,000; for cooking, heating and power purposes the rate is to be $2 per 1,000.

AT the annual meeting of the Atlantic City (N. J.) Gas and Water Company a dividend of $1 per share was declared. The officers chosen were: Directors, Joseph A. Barstow, Thos. K. Reed, Jos. H. Barton, Chas. Evans, J. B. Champion, John E. Mehrer, Fred. Hemsley, John Roberts, Wm. L. Elkins, P. A. B. Widener, Geo. S. Graham, Jas. McManus and Savery Bradley; President, J. A. Barstow; Secretary, Thomas K. Reed; Treasurer, Jos. H. Barton.

The gas rate at Exeter, N. H., is to be reduced on June 1st to $1.50 per 1,000 cubic feet, a concession of 80 cents per 1,000.

MR. JACOB LANG, for many years (up to 1896) Chief Inspector of Meters, Philadelphia Bureau of Gas, died in Norristown, Pa., about a fortnight ago. Deceased was born in Philadelphia in 1842, and was at one time quite prominent in the Republican party management as practiced in Philadelphia.

THE special committee appointed by the town of Revere, Mass., to consider the advisability of building a gas works, to be operated on municipal account, reported that such plan was inadvisable. It is likely that the Chelsea Gas Light Company will take steps toward the supplying of gas in Revere.

MR. ARTHUR GRAHAM GLASGOW, of Messrs. Humphreys & Glasgow, sails for Europe Saturday next.

THE offices of the Chicopee (Mass.) Gas Light Company have been removed to the Kendall Block, which change will be appreciated by the Company's customers.

THE offices of the Montclair (N. J.) Gas and Water Company, which have hitherto been located in the adjoining borough of Bloomfield, are now established at No. 559 Bloomfield avenue, Montclair.

THE proprietors of the Southbridge (Mass.) Gas and Electric Company have decided to change their oil gas plant over to the regular water gas system.

A CORRESPONDENT, who was present at the last meeting of the Texas Gas and Electric Light Association, writing from Dallas, Tex., under date of the 18th inst., says: "I inclose you the following clipping from the *Electrical Engineer*, of date of 5th inst.: 'The many friends of Mr. William M. Brooke, the popular representative of the Central Electric Company in Texas, will be glad to learn that Mr. Brooke's genial qualities, as well as his attention to wants of his customers, have been recognized in an unusual manner by the Texas Gas and Electric Light Association. At their recent meeting, in San Antonio, Tex., Mr. McGoldrick, of the San Antonio Gas and Electric Light Company, on behalf of the Association, presented Mr. Brooke with a handsome gold medal, inscribed, "The most popular lighting man in Texas." Mr. Brooke's career in the electrical business began in the fall of 1893, when he identified himself with the Central Electric Company in a subordinate capacity, the management of which was quick to recognize his qualifications. His progress, therefore, was very rapid, his experience as a salesman in other lines being quickly adapted to the intricacies of the electrical supply trade. In 1894 Mr. Brooke was given full charge of the Southwestern territory, with headquarters in New Orleans. The wisdom of placing this important territory in Mr. Brooke's hands is evidenced by the action of the Texas Gas and Electric Light Association.'

"The above personal, without in any sense wishing to detract in the least from the sentiments therein expressed, I desire to correct, the inaccuracies in it bearing on the action of the Texas Gas and Electric Light Association. Mr. McGoldrick made a personal donation of this handsome gold medal, inscribed as stated, and presented it, as stated, at the banquet; but it was offered to the member who would bring in the greatest number of applications for membership in the Association. That Mr. Brooke was very zealous is beyond dispute, and the same is true as to his popularity. He was on the Membership Committee, whose duty it was to bring in as many new members as possible, and for his success in that line he deserved a medal; but as it was not the gift of the Association, it is only justice to Mr. Brooke's contemporaries that this fact be made known."

AT the annual meeting of the Perth Amboy (N. J.) Gas Light Company the following officers were chosen: Directors, P. Convery, Geo. A. Seaman, J. L. Kearney, J. W. Whelan and W. H. McCormick; President, P. Convery; Treasurer, Geo. A. Seaman; Secretary and Superintendent, J. C. Ross.

THE Cambridge (O.) Gas and Electric Company, a corporation formed for the purpose of taking over the gas and electric lighting supply of Cambridge, has been incorporated by Messrs. J. A. Shepherd, Ira L. Bung, Willis Vickery, S. W. Roberts and John L. Young.

MR. H. L. RICE, Superintendent of the City Gas Company, of Norfolk, Va., has arranged a series of four lectures on cooking by gas, the dates of same to be the first four days of June. The demonstrator is Miss Anna Barrows, of Boston, the lectures will be given "at half after 10 o'clock," A.M., and the demonstrations are to be made in the assembly room of the hall of the Y. M. C. A. Admission to the lectures is by ticket.

MR. T. D. TINSLEY, Receiver of the Macon (Ga.) Gas Light and Water Company, in his annual report for the year ended May 1, 1897, has this to say respecting the condition of the gas plant: "The gas plant is in good condition; new retorts have been purchased for the benches, and the work of placing in position will be completed during the summer, when it can be done at the least inconvenience to the Company and to the public. Additional holder capacity is needed, but this can be obtained by enlarging the capacity of the present holders rather than the building of a new one. An additional bench should be built next year to increase the manufacture of gas in order to provide for the additional wants of our citizens." Speaking of the condition of the electric plant, Receiver Tinsley says: "The electric plant, while in much better condition than when the receiver took charge, is not modern in any respect, and it is difficult to obtain satisfacrory results and meet the wishes of the public unless a plant of this kind can keep abreast with all the improvements which are constantly being made in electrical apparatus."

THE proprietors of the Municipal Gas Company, of Albany, N. Y., are meeting with much success in their attempts to popularize gas for cooking, the new low rate for a gas supply on fuel account, of course, being mainly responsible for public inquiry in this regard. The Company, however, is to be complimented, too, on the handsome manner in which it carries, in its well located offices in the Albany Savings Bank building, for public inspection, a complete line of gas cookers, heaters, etc.

THE Vicksburg (Miss.) Gas Light Company's plant is to be overhauled. A new holder is named in the betterment list.

THE Board of Directors chosen at the annual meeting of the Portland (Me.) Gas Light Company perfected the following organization: President, Edward H. Daveis; Clerk, Frank E. Moore; Treasurer, Samuel Rolfe.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,

PROPRIETORS.

MONDAY, MAY 31, 1897.

The Market for Gas Securities.

The market for city gas shares is in a curiously uneven condition, the differences between ordinary buyers and sellers reflecting evidently the uncertainty that prevails as to an adjustment of values in trades between those who "do not know." The oddity of the situation is most marked in the matter of the quotations for Consolidated. All other city shares, excepting Mutual and Equitable, are now fully at their book and face value, whereas Consolidated absurdly fails to reflect its ultimate or present worth in the reported quotations. Our advice is that no mistake can be made in the purchase of Consolidated, even at 10 points over our current quotations. The matter of complete consolidation is progressing steadily, and the turn will be made quickly. The general market is about even, with quite some inquiry for shares that have heretofore been considered "slow." We note a sale at auction of 80 shares Yonkers Gas Light Company, at 125.

Gas Stocks.

Quotations by Cochran & Close, Brokers and Dealers in Gas Stocks.

35 Wall St., New York City.

May 31.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$35,430,000	100	159	160¼
Central	500,000	50	195	..
" Scrip	220,000	..	100	.
Equitable	4,000,000	100	218	220
Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	246	250
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	.
Northern	150,000	50	85	.
" Bonds	150,000	1,000	..	98
New York and East River	5,000,000	100	60	61
Preferred	2,000,000	100	96	98
Bonds 1st 5's	3,500,000	1,000	110¼	111
" 1st Con. 5's	1,500,000	..	103	104
Richmond Co., S. I.	348,650	50	80	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	102	103
Preferred	5,000,000	100	118	120
Bonds, 1st Mortgage, 5's	1,500,000	1,000	111	113
Yonkers	299,650	50	130	
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	104¼	105
" " Bonds (5's)	15 000,000	1,000	111¾	112
Bay State	15,000,000	50	8⅝	8⅝
" Income Bonds	2,000,000	1,000	..	85
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	81¼	.
2d " " "	3,000,000	1,000	60	..
Buffalo Mutual	750,000	100	125	..
" Bonds	200,000	1,000	95	100
Central, San Francisco	2,000,000	..	95	..
Chicago Gas Co.	25,000,000	100	81¼	81⅜
Chicago Gas Lt. & Coke Co. Guaranteed Gold Bonds.	7,650,000	1,000	94	94¼
Columbus	1,089,000	..	77½	78x
1st Mortgage	1,085,000	..	..	96
Consumers, Jersey City	2,000,000	100	..	73
" Bonds	600,000	1,000	100	102
Cincinnati G. & C. Co.	8,500,000	100	201	201¼
Consumers, Toronto	1,600,000	50	184¼	187
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	1,000,000	100	53¼	56
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490,000	..	..	..
Detroit	4,000,000	.	22	..
" Con. Bonds	4,312,000	..	72½	74
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	81	83
" Bonds	2,000,000	..	89	92
Hartford	750,000	25	..	145
Indianapolis	2,000,000	..	132	135
" Bonds, 6's	2,650,000	..	105½	107½
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind	1,000,000	100	84	86
Bonds	1,000,000	1,000	92	95
Louisville	2,570,000	50	..	..
Laclede, St. Louis	7,500,000	100	22¾	23
Preferred	2,500,000	100	83	85
Bonds	9,084,400	1,000	96½	97
Little Falls, N. Y.	50,000	100	..	100
Bonds	25,000	..	..	100
Montreal, Canada	2,000,000	100	200	.
Newark, N. J., Gas Co.	1,000,000	..	98	98
Bonds, 6's	4,000,000	..	123	..
New Haven	1,000,000	25	225	..
Oakland, Cal.	2,000,000	..	53¼	54
" Bonds	750,000	..	..	..
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,00	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	..	175
Rochester Gas & Elec. Co.	2,150,000	50	..	..
Preferred	2,150,000	50	88	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10.000,000	100	94	94¼
St. Paul Gas Light Co.	1,500,000	100	79	81
1st Mortgage, 6's	650,000	..	84	87
Extension, 6's	600,000	..	..	..
General Mortgage, 5's	2,400,000	.	88	90
Syracuse, N. Y.	500,000	25	..	..
Washington, D. C.	2,000,000	20	250	..
Western, Milwaukee	4,000,000	100	65	67
Bonds, 5's	3,556,000	.	94	95½
Wilmington, Del.	550,000	50	200	202

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Marquand & Parmly, New York City ... 876

DIVIDEND NOTICE.

OFFICE OF WELSBACH COMMERCIAL COMPANY,
40 WALL ST., NEW YORK CITY, May 13, 1897.

The Directors have this day declared a quarterly dividend of two (2) per cent. on the preferred stock, payable on June 10, 1897, to stockholders of record at the close of business May 29. The transfer books of the preferred stock will be closed from May 30 to June 10, both inclusive. Checks will be mailed

1146-3 EDWARD C. LEE, Treasurer.

Position Wanted

In a Coal or Water Gas Works by a man 24 years of age. Can test and set meters, make lead connections, lay mains, run services, connect gas stoves, and be handy man generally. Best of references.

1146-4 Address "R.," care this Journal.

Position Desired

As Superintendent of Gas Works or Gas and Electric Light Works,

By a man 34 years of age. Sixteen years' experience in the manufacture and distribution of Coal Gas as Supt., and four years in the Electric line. Thoroughly competent to take charge of any plant, separately or combined. A practical mechanic, and understands the erection of gas plants and everything pertaining to the business. Not afraid of work. Salary no object until ability is proven. Best of references.

1103-tf Address "M. E. J.," care this Journal.

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An all-round man as Manager of a small coal gas plant, in a pleasant town in Maryland. Must be competent to attend to all office work and exercise a general supervision over entire plant. Address, giving age, references, experience and salary expected,

1146-2 "H. S.," care this Journal.

WANTED,

An 8-Foot Station Meter,

Second-hand, but in good condition. Address

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A man with some experience in the gas bus'ness as

Assistant Superintendent

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1145-tf Address "G. C.," care this Journal.

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The undersigned Company requires, for auxiliary coal gas plant, Station Meter, capacity 8,000 to 10,000 cubic feet per hour. Full particulars required.

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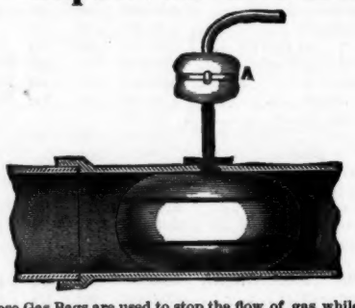

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5 "	"	"	1.05	20 "	"	"	12.00
6 "	"	"	1.75	24 "	"	"	17.00
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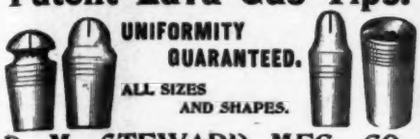

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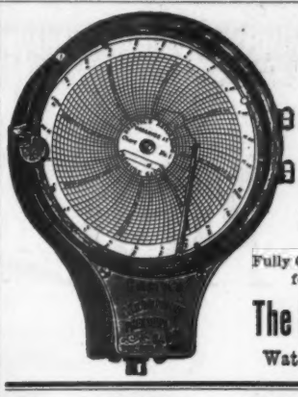

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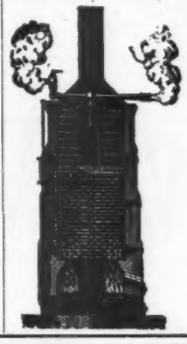

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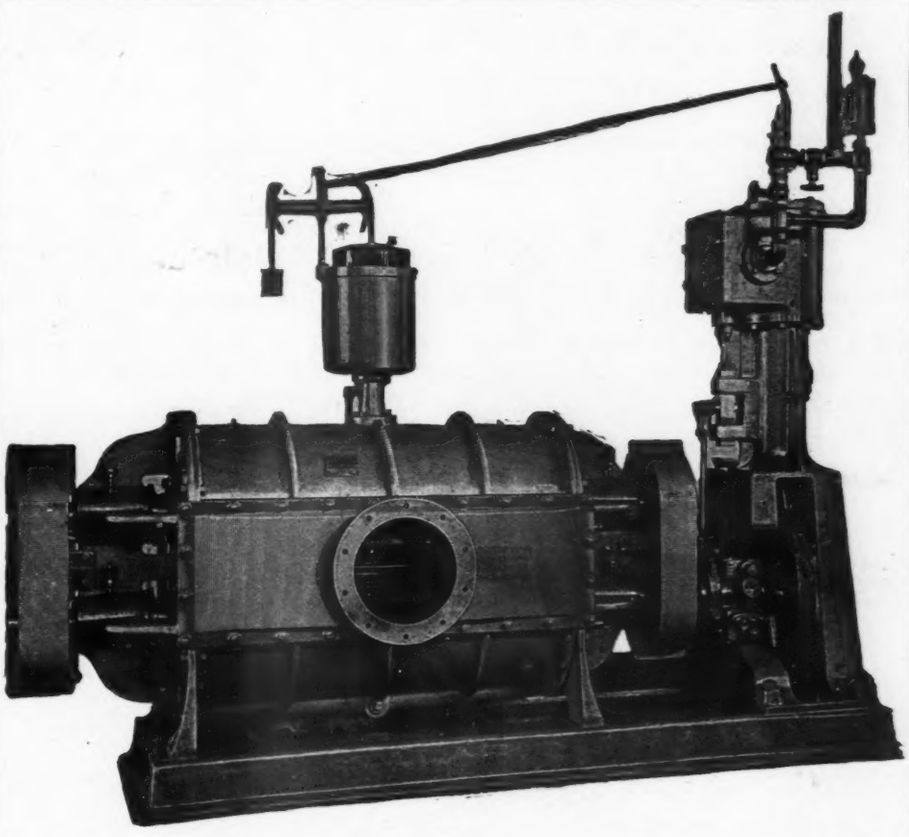

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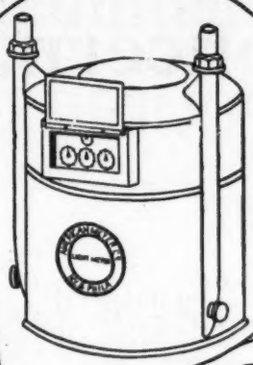

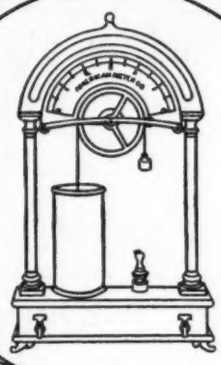

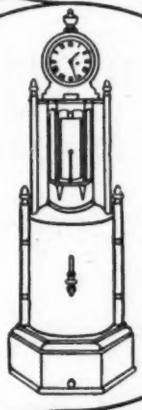

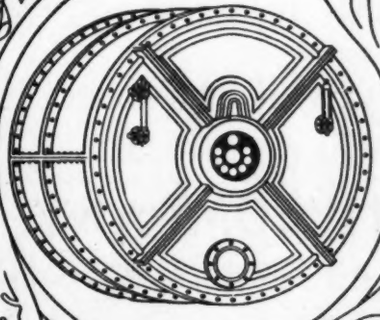

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CHICAGO, ST. LOUIS,
SAN FRANCISCO.

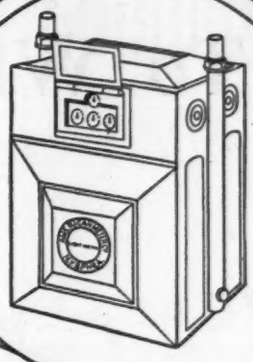
PUBLIC LIGHTING TABLE.

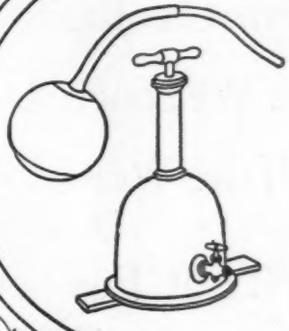
JUNE, 1897.

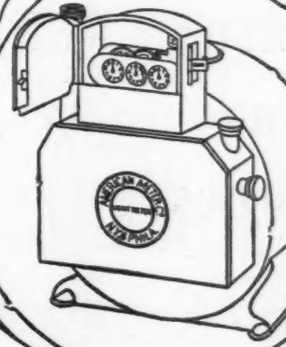
Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Tue.	1	7.50 PM	3.30 AM	7.15	3.15
Wed.	2	7.50	3.30	7.15	3.15
Thu.	3	7.50	3.30	7.15	3.15
Fri.	4	9.50	3.30	7.25	3.15
Sat.	5	10.20	3.30	7.25	3.15
Sun.	6	10.40	3.30	7.25	3.15
Mon.	7	11.10 FQ	3.30	7.25	3.15
Tue.	8	11.30	3.30	7.25	3.15
Wed.	9	12.00 AM	3.30	7.25	3.15
Thu.	10	12.30	3.30	7.25	3.15
Fri.	11	1.10	3.30	7.25	3.15
Sat.	12	1.50	3.30	7.25	3.15
Sun.	13	No L.	No L.	7.25	3.15
Mon.	14	No L. FM	No L.	7.25	3.15
Tue.	15	No L.	No L.	7.25	3.15
Wed.	16	8.00 PM	10.30 PM	7.25	3.15
Thu.	17	8.00	11.10	7.25	3.15
Fri.	18	8.00	11.40	7.30	3.15
Sat.	19	8.00	12.00 AM	7.30	3.15
Sun.	20	8.00	12.20	7.30	3.15
Mon.	21	8.00 LQ	12.50	7.30	3.15
Tue.	22	8.00	1.10	7.30	3.15
Wed.	23	8.00	1.30	7.20	3.15
Thu.	24	8.00	2.00	7.30	3.15
Fri.	25	8.00	2.30	7.30	3.15
Sat.	26	8.00	3.30	7.30	3.15
Sun.	27	8.00	3.30	7.30	3.15
Mon.	28	8.00	3.30	7.30	3.15
Tue.	29	8.00 NM	3.50	7.30	3.15
Wed.	30	8.00	3.30	7.30	3.15

TOTAL HOURS LIGHTING DURING 1897.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	233.00	January	423.20
February	187.20	February	355.25
March	202.00	March	355.35
April	170.40	April	298.50
May	163.00	May	264.50
June	140.40	June	234.25
July	151.40	July	243.45
August	167.30	August	280.25
September	174.40	September	321.15
October	200.00	October	374.30
November	205.20	November	401.40
December	220.10	December	433.45
Total, yr.	2216.00	Total, yr.	3987.45







To Whom It May Concern.

WE have learned that the makers of the "Sunlight" lamp assert that there has been a decision in the English Courts which saves them and their customers from liability as infringers of the Welsbach patents.

We assure the public there is no decision of any Court, in England or elsewhere, that directly or indirectly warrants the statement or inference that the lamp sold by the Sunlight Incandescent Gas Lamp Company of America is not an infringement of the Welsbach Light as made under the American patents, of which the Welsbach Light Company is sole and exclusive owner.

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WELSBACH LIGHT COMPANY.

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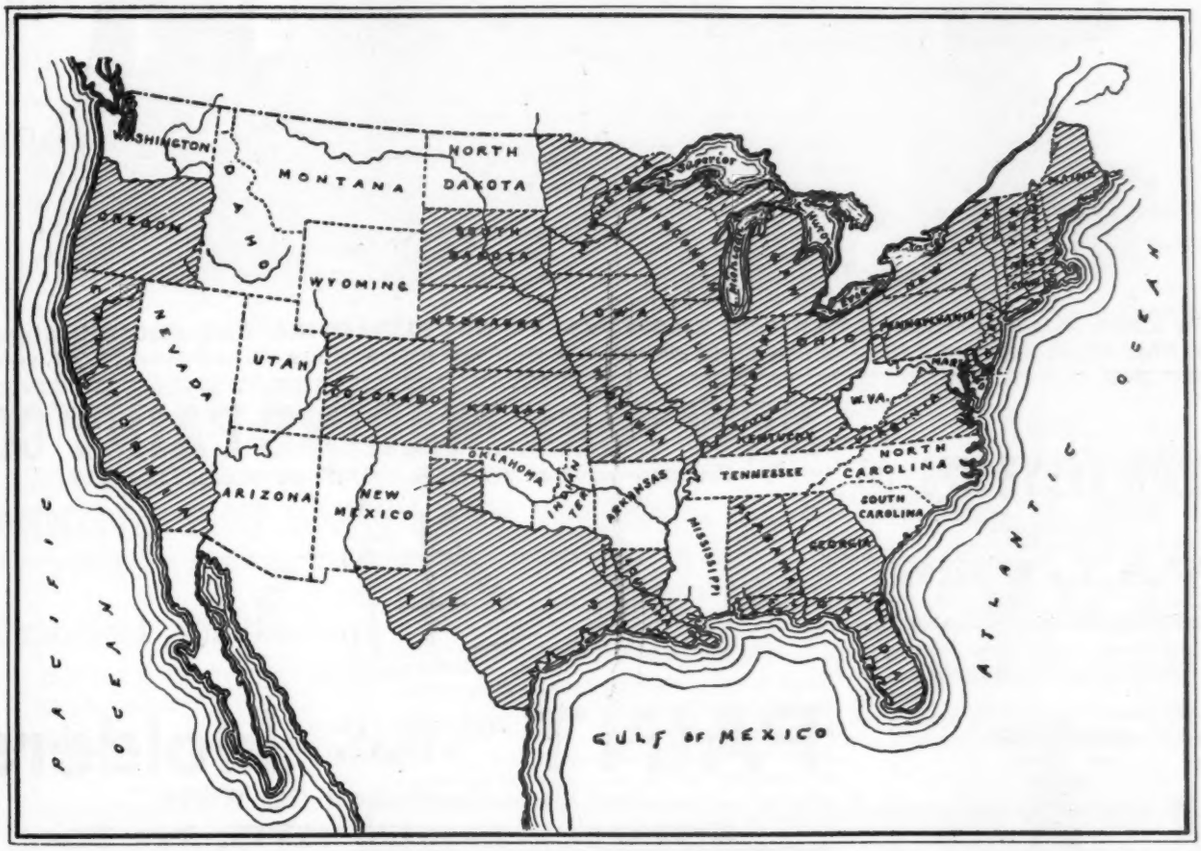

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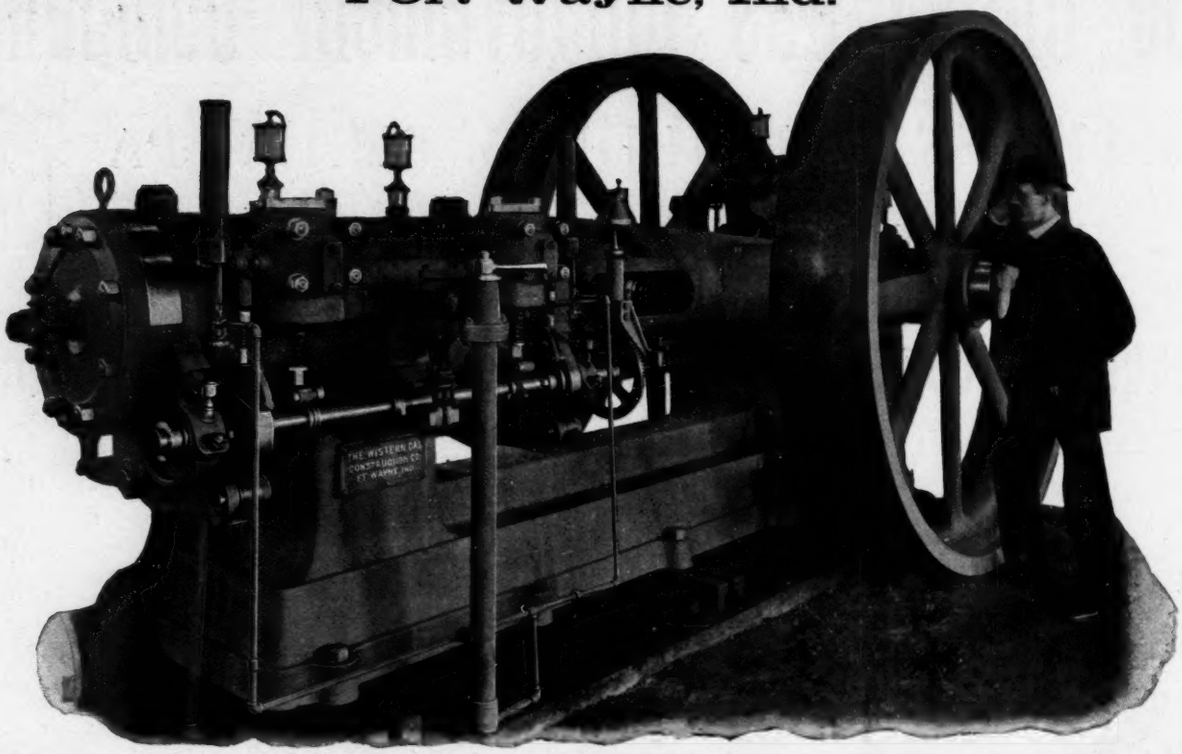

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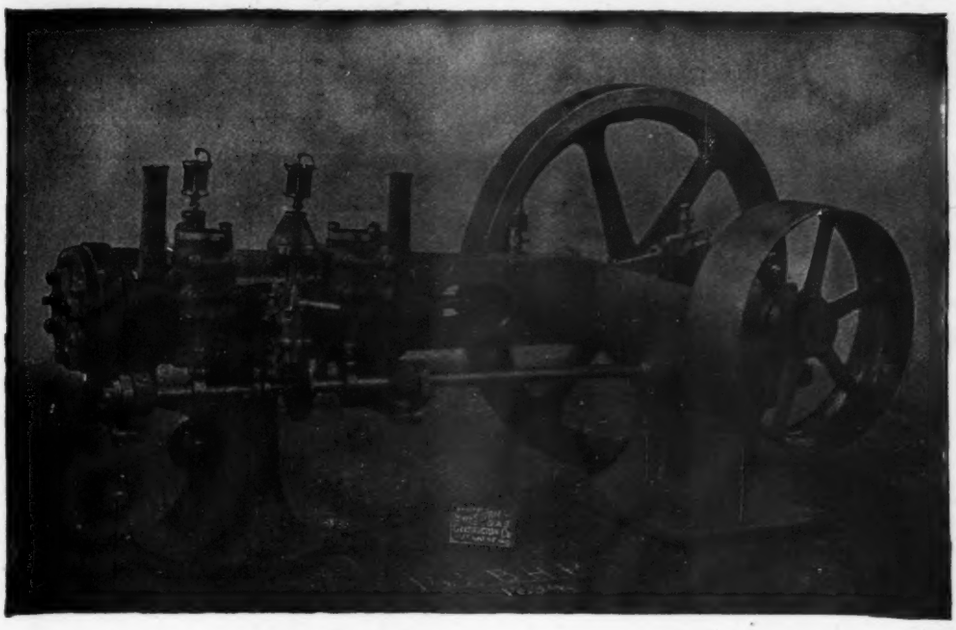

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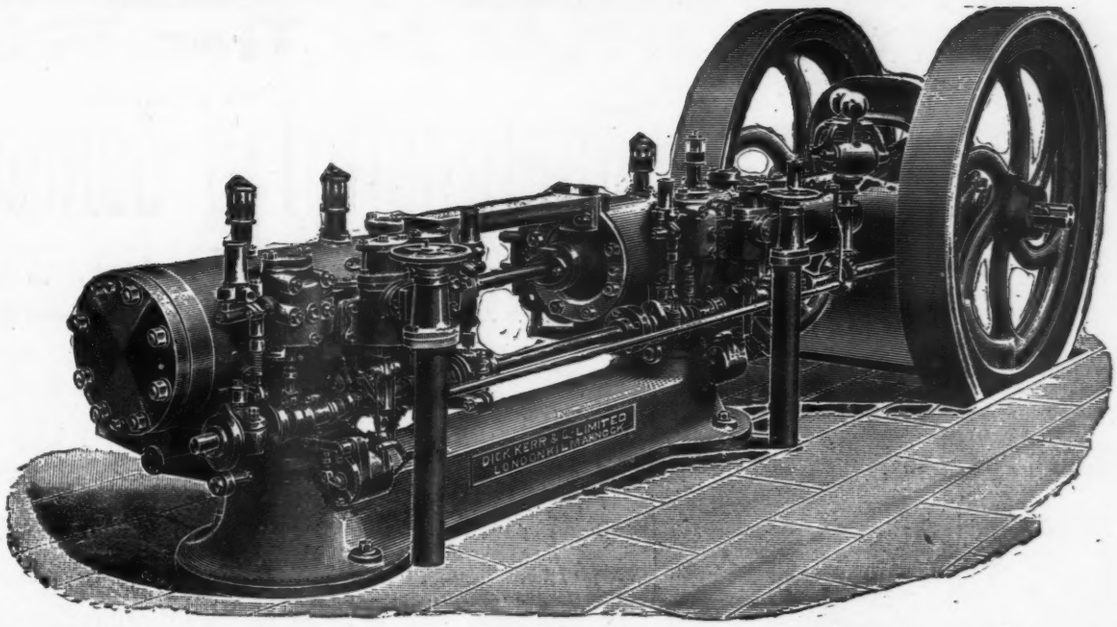

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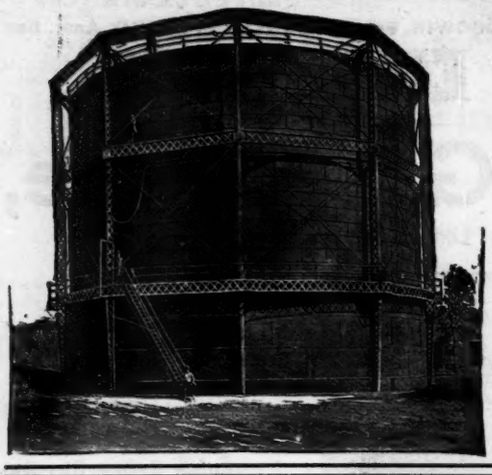

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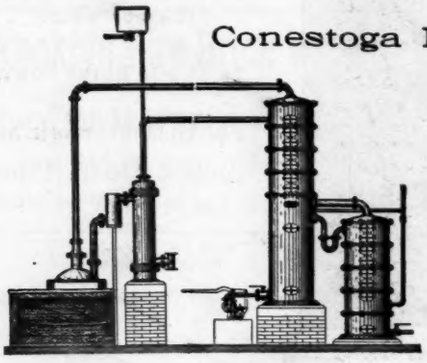

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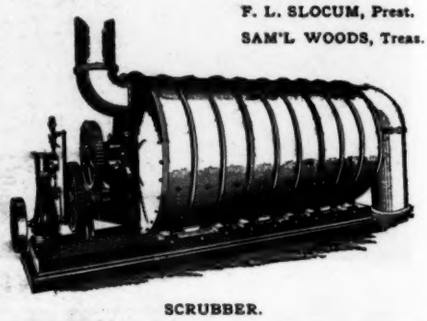

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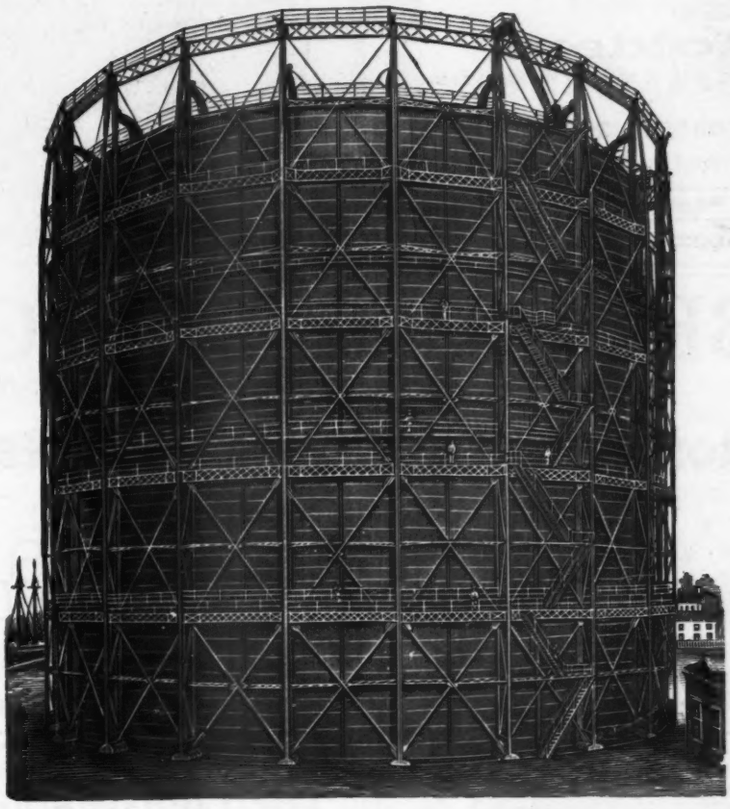

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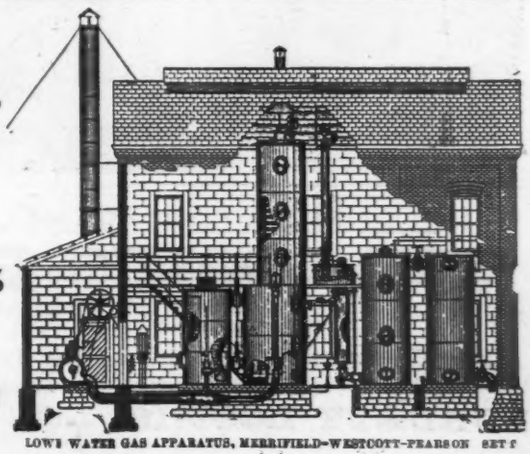

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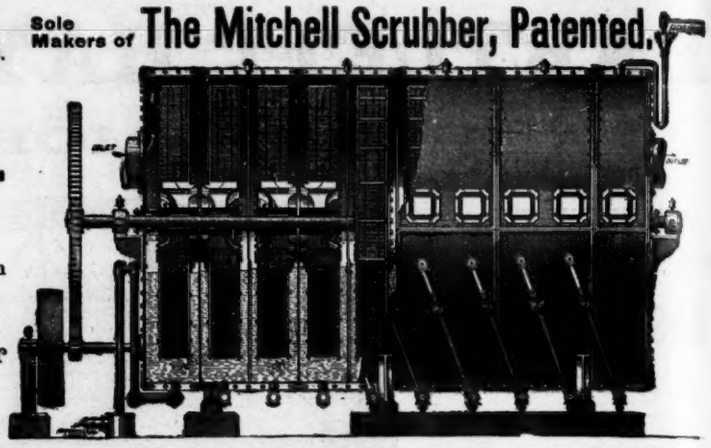

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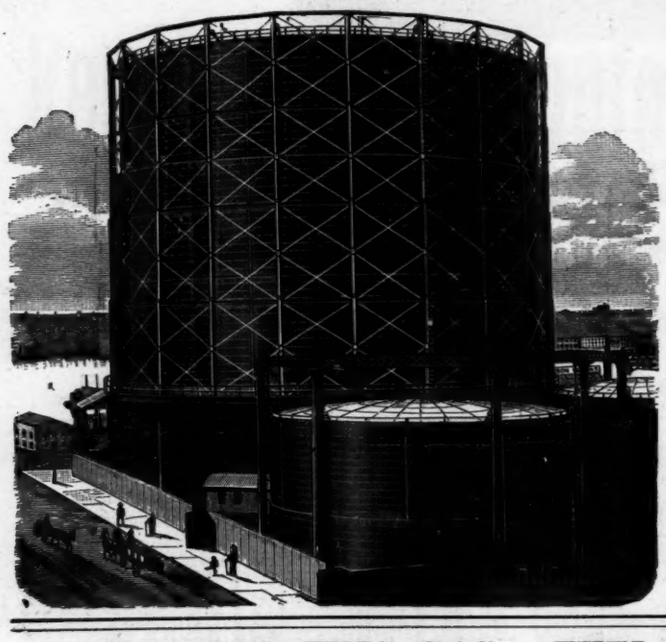

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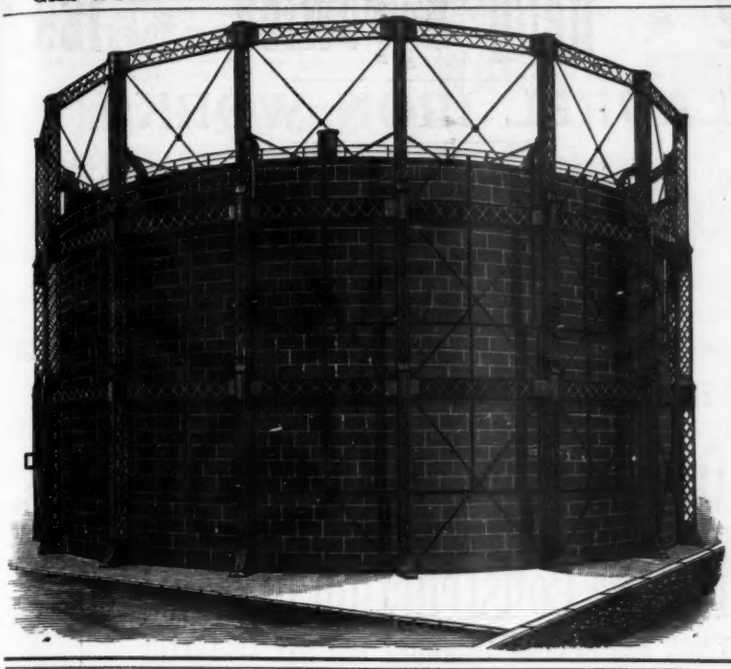

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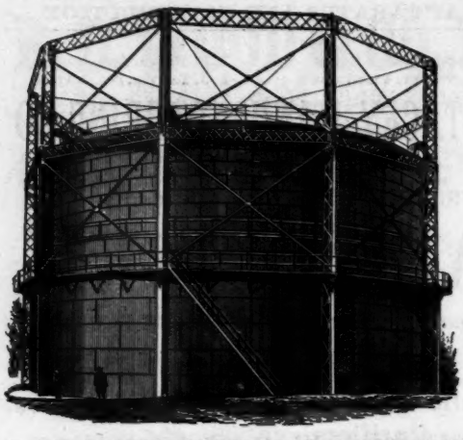

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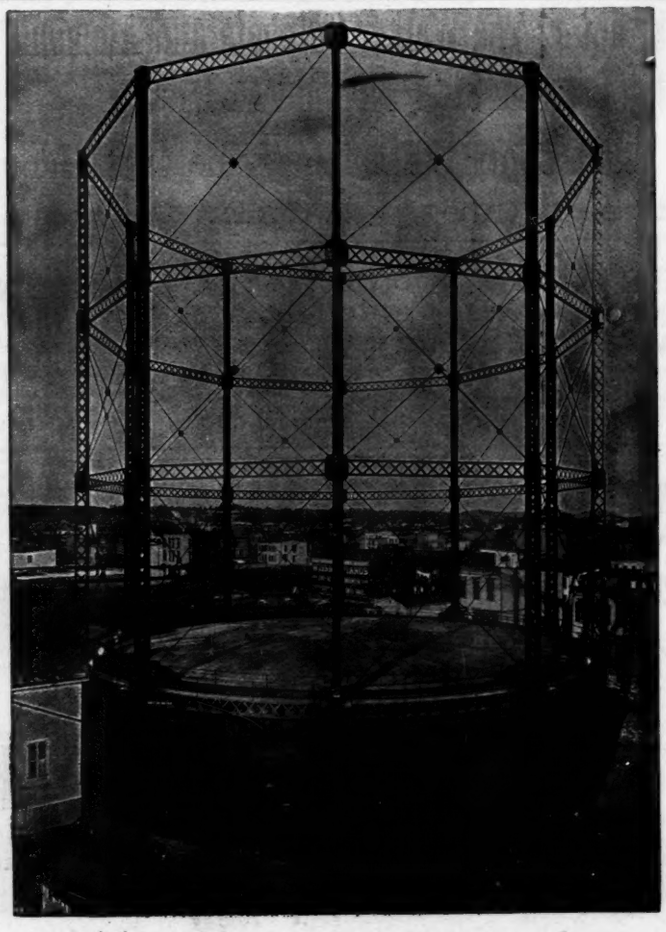

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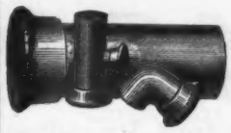

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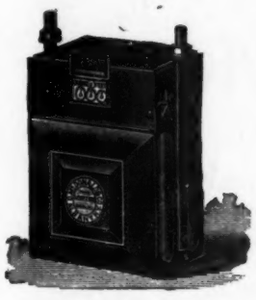

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